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The Farmer's Digest

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The Farmer's Digest

Volume 11 December,1947 No. 7

How to Select Young Bulls and Heifers

Condensed from New Jersey Farm and Garden

V. A. Rice

Massachusetts State College

THE breeder's success and progress depend almost entirely on the methods he uses in selection. If selection methods are sound, progress in breeding better livestock is practically assured. Without selection standards and methods, we are quite apt to end up 20 or 30 years hence at the same levels from which we set out.

There are many problems in selection of dairy cattle, as is evident even in this partial list of things we want in our herds:

1. High Milk Production.
2. Suitable Butterfat Test.
3. Suitable Breed Type, including size, quality, symmetry, uniformity, mammary development, well-set legs.
4. From a Naturally Fertile Strain.
5. Persistency of Production.
6. Longevity.
7. High Resistance to Disease Attacks.
8. Easy Milkers.
9. Good Dispositions.

Any reader can probably supply many more things that he wants in his animals.

It is difficult to get even one or two or three of the above-mentioned desirable qualities in any one animal, and the more things we select for, the less likely we are to be able to find them in any one animal. For example, if one-third of the animals in a breed did suit us from the standpoint of production and one-third did suit us from the standpoint of type, then in general only about one out of nine would suit us in both respects.

If type and production were highly correlated, then perhaps one out of five or six instead of one out of nine would suit us, but actually the correlation between type and production is not particularly high, although there is some correlation. It seems obvi-

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ous, therefore, that intelligent selection is a most difficult problem.

We are going to break this problem up into two categories: one, the selection of heifers to save in one's own herd, and second, the selection of bulls. In other words, selection in dairy cattle is a double-barrelled affair, and we will tackle the heifer selection problem first.

Fortunately, there is a relatively easy and satisfactory manner in which this problem can be handled. It consists of the breeder setting up his own herd in the form of a chart as illustrated in Figure 1.

In Figure 1, we show a partial (for want of space) chart of the Jersey herd at the Massachusetts State College. This chart is to be read in the following fashion: Across the top of the chart will be found Sires A, B, and C, which followed in that succession in the herd. The result is that as we read down any column, we automatically get all the daughters of these sires. Underneath each sire is given his daughters' production and that of their dams, together with the equal-parent index of the succeeding bulls. The equal-parent index of a bull is found by multiplying the average amount of milk and test of his daughters by two and then sub-

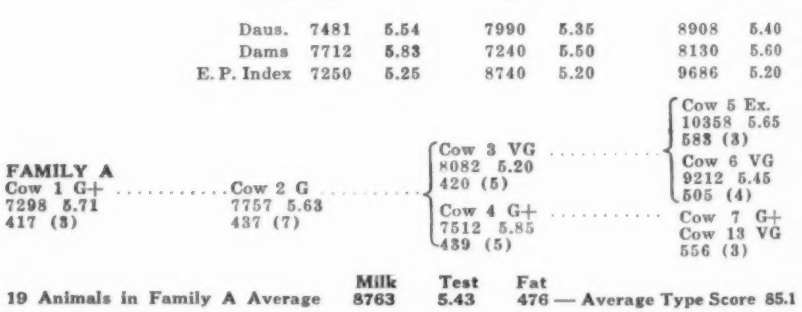

FIGURE 1. PARTIAL CHART OF A JERSEY HERD

tracting the average amount of milk and test of his mates (dam of his daughters). This puts the daughters just half-way between the dam's average and the sire's index.

At the left-hand side of the chart, there are shown two cows, namely Cow 1 and Cow 10, which were the female founders of the cow families. For instance, Cow 1 in Family A was bred to Sire A and got daughter Cow 2. This animal in turn was bred to Sire B and left two daughters in the herd—Cows 3 and 4. Cow 3 in turn was bred to Sire C and left two daughters—Cows 5 and 6; while Cow 4 was also bred to Sire C and left as a daughter Cow 7. The same procedure holds for Family B in the lower part of the chart. This makes it so that when we read across the page from left to right, we get all the descendants of these two cows. *In other words, reading across the page gives a cow family.*

Chart Makes It Easier

With each cow is given her type, her average milk production, her average total fat, and in parenthesis the number of lactations involved in getting these average production figures; all the figures being standardized to mature equivalent, 2x milking for 305 days. Underneath each family is given the average production of all the animals in that family.

Even a brief study of the chart in Figure 1 will show us that there are very distinct differences between these two cow families, and it is obvious that Family A is a much better family both in type and production than is Family B. In Family A the production shows a gradual increase as we read across the sheet, while in Family B the production goes up and down. The type of animal in Family A is also much superior to that of Family B.

To make up this kind of a chart from pedigree, D.H.I.A., Herd Test, or A.R. records is quite a little chore, especially if one is doing it for the first time, but it is not beyond the powers of any breeder of average intelligence. For a herd of 20 to 30 cows, making up such a chart might utilize the winter evenings of a week or two weeks' period. Once the chart is made up, adding new animals year by year as they come into production, is an easy matter.

History at a Glance

Only when a herd has been so charted can a breeder have a clear-cut, over-all picture of his herd. Many of the other things listed as desirable qualities in our animals could also be noted on such a chart, such things as ease of milking, disposition, persistency of production, freedom from disease, and so on.

All of us know that certain traits and qualities "run in families." For instance, in Family A in Figure 1, the animals are of good size, averaging nearly 100 pounds heavier than those in Family B. The Family A cows also have much better attached udders, those in Family B tending to be somewhat pendulous. Weak, sickled hind legs also tend to run through Family B, as does difficulty in breeding and a tendency to eversion of the vagina following calving. With such a chart before one, the job of selecting heifers is made relatively easy. From what has been said about these two cow families, it is obvious that selection of heifers should be stopped in Family B and the heifers for replacements selected in Family A.

Without such a chart, a breeder would be tempted to save heifer calves from Cow 13 in Family B. This cow has a very good record herself and is of good type. On the basis of her own qualities, Cow 13 is a good cow but she is in a poor family. Animal breeders are gradually relearning the old principle that *animals are more likely to transmit like their family line than they are to pass on their own good qualities.* With a herd chart like that in Figure 1, a breeder knows before calves are dropped whether or not he is going to save them. Actually a breeder will make better progress selecting somewhat less desirable looking calves from good families than he will by selecting better appearing calves from poor families.

In our herd we had about 20 Jersey cows 30 years ago and at the present time all of the animals in the herd trace back to five of those original cows. The other female lines have died out completely for one reason or another. We now have about 25 Jersey cows in our herd, and 30 years hence it will no doubt again be true that all of the then existing families will have come from relatively few of the female animals present in the herd today.

In other words, the selection of the best heifers to save, by which we mean selecting heifers in our best female lines, is a continuous process. When families get to a good size, we will also be very interested to note that there are some female lines within families which are much better than other female lines within the same family, in spite of the fact that the same culls occur through the succeeding daughter generations. This half of selection is solely in the breeder's own hands. No one else can do it for him and unless he does it himself, his selection is going to miss the mark about as often as it hits.

Now let's examine the other barrel of our double-barrelled problem: selecting bulls. We gen-

erally do this from outside herds. This, in one sense, is a much more important problem than the one we have just discussed due to the fact that a bull, on the average, will leave six to ten times as many offspring in a herd as will any one cow.

In our own Jersey herd at the present moment, each cow that has daughters in the herd averages 1.3 daughters each. The last three bulls we have used, however, left 14, 18, and 15 daughters, respectively. So far as any one daughter is concerned, the sire and the dam are jointly and equally responsible for its qualities. But since bulls do generally leave many more offspring in a herd than do individual cows, the selection of bulls is, in this sense, really the most important task which the breeder faces.

It is a bit unfortunate that in the selection of bulls, the breeder is almost completely dependent upon his breed association. If he is in a breed which is approaching the problem of evaluating bulls in a realistic fashion, he is indeed fortunate. If the breed has systems for getting all the essential facts about bulls and publishes them for the breeders' use, then the breeder can learn to use this material intelligently. If the breed is not doing this job, naturally the breeders are going to be severely handicapped.

What kind of information do we want about our bulls? We want as quickly as possible, a judgment of the bull so far as transmission of production is concerned, and on a completely unbiased basis. In practice, this means that we have indexes on bulls secured by comparing the production of their first eight or ten daughters with the production of the dams. The information gives us a fair basis for judging the worth of the bull from a production transmitting basis. If, however, the daughters are a selected group rather than the first 10, just as they were dropped in the herd, then the bull's index can be very misleading.

Now let's get down to the practical basis of selecting a young bull, which is what most breeders do, for the simple reason that older good proved bulls are scarce and expensive. So far as production is concerned, there are three things to be weighed in the choice of a young bull. What we would like, of course, is a young bull with a three- or four-generation pedigree in which all the bulls have good indexes on unselected daughters and in which all of the cows have acceptable records. These, however, are hard to find. We can simplify the problem to a considerable extent by considering just three places in the pedigree.

First, we would like to have a son of a good proved bull. If we

can get this, we won't worry too much about what is behind that good proved bull—that is, about his pedigree. What we are interested in primarily is what is coming out of the bull rather than in what lies behind him, so that if we can get a son of a good proved bull, we take care of the upper half of the pedigree.

The next point to be stressed in selecting a young bull is to have him *out of a cow who is the daughter of a good proved bull.* If we can do this, we automatically take care of another quarter of the pedigree on the basis of the same logic expressed just above.

The third important factor is that he is *out of a good cow family.* Most breeders pay a lot of attention to the record of the dam of a young bull.

On the basis of logic, this will not get us very far because, even though we grant that a cow makes a big record because of her good inheritance, that good inheritance is halved once in getting to her son that we are selecting, and his inheritance is halved again in getting to each of his daughters. In plain words, the inheritance of the dam of a young bull has been quartered by the time it gets to her son's daughters. This, coupled with the fact that environment plays such a large part in actual production of dairy animals, makes the use of the dam's record in the selection of young bulls of very questionable value.

I recently studied about 400 Ayrshire bulls which were indexed on all their (unselected) daughters. These bulls were out of cows with records. What we wanted to find out was: did the sons of high record cows have higher indexes than the sons of low record cows? The correlation between the size of the dam's record and her son's index was exactly zero which, in practical terms, means that we are more likely to get a high index bull from a high record cow than we are from a low record cow.

The much more important consideration, however, is the general level of excellence of the family to which the dam of our bull belongs. The dam, in other words, is much more likely to transmit to her son like her own family than like her own individual qualities. This is the basis for the old Scotchman's sound advice to his son: namely, "Never marry the only good girl in a family."

This is a lesson which the old-time breeders apparently appreciated much more than do modern ones. But it is a prime lesson that modern breeders must learn if their efforts are going to be more successful. We must think more in terms of groups of animals, and less in terms of the individual merit of animals.

Both from the standpoint of

logic and from the standpoint of factual data, the size of the record of the dam of a bull seems to be valueless. But let's get this straight. Don't infer, please, that this writer said that the dam of a bull counts for nothing. The dam of a bull does count for one-half of the inheritance of her son, but the *actual record* of a cow is not a good measure of how good her son will be.

So far as the top side of the pedigree is concerned, the size of the index of the sire of a bull is a good measure of how good the bull is likely to be; in short, there is a good correlation between the indexes of sires and their sons.

For the bottom half of the pedigree, the dam's record is not a good measure of the index of her son—the correlation is not high. What, then, should we pay attention to on the bottom side?

First, let the dam have an acceptable record (breed average or a little better and no objection to a high record).

Second, let her be the daughter of a good proved sire.

Third, let her be a member of a good cow family.

I recently made a brief study of a great mass of unselected data in one of our dairy breeds. In this data were all sorts of pedigrees so far as records are concerned. I studied them primarily in terms of the sires of the bulls and the sires of their dams (maternal grandsires).

When we had a son of a poor sire out of a daughter of a poor sire, we had no chance of getting a good bull. When we had a son of a poor sire out of a daughter of a good sire, we had about one chance out of five of getting a good bull. When we had a son of a good bull out of a daughter of a poor bull, we had about one chance out of two of getting a good sire, and when we had a son of a good sire out of a daughter of a good sire, we had about two chances out of three of getting a good sire.

We will never be able to take all of the guess out of breeding largely because inheritance is a halving and sampling process. The way to take most of the guess out of the selection of a young bull is to select a son of a good bull out of a dam which is by a

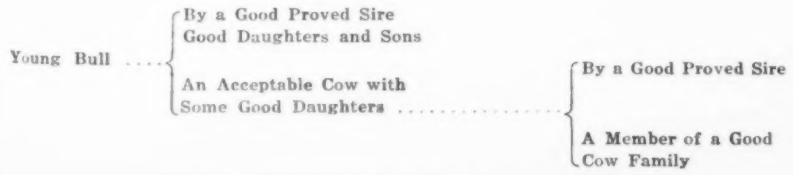

FIGURE 2. THE MAKINGS OF A GOOD YOUNG BULL

good bull, and this dam in a good cow family. A good dairy bull pedigree is shown schematically in Figure 2.

As we stated earlier, the choice of a young bull is a difficult matter at best. Figure 2 shows the kind of pedigree we should like to find. To provide the data of an unselected nature for proving the sire and maternal grandsire of our bull calf, we are forced to depend on our breed associations. To make sure that the young bull is out of a cow which belongs to a good cow family, we must depend upon the herd chart of the breeder. When breeds and breeders accept the full responsibility for supplying unselected data on breeding animals, we can confidently build our plans for improving our herds. Until that time comes, we will have to attack the difficult problem "by guess and by gosh" and the results will require considerable profanity for adequate description.

When breeders set their own herds up in chart form (Such as Figure 1) so that they can really know them, and when our breed association secures and publishes unbiased and unselected facts about the transmitting ability of bulls, we will be on the high road to better herds. Until that time comes, we will continue to stumble around following good bulls with poor ones, selecting in poor families as well as good ones, and ending about where we started a lifetime ago.

"It is neither wealth nor splendor, but tranquillity and occupation which give happiness."

Thomas Jefferson

Broomsedge Land Yields Well

Condensed from The Southern Planter

M. H. McVickar
Virginia Agricultural Experiment Station

If Rip Van Winkle had chanced to open his eyes in the direction of Brush Mountain, three miles from Blacksburg, Virginia, nothing would have stupified him more than to see a remarkable field of corn growing on the barren and broomsedge-infested mountainside.

It doesn't make sense to the Montgomery County natives; a fine, heavy stand of corn on a patch of land heretofore abounding in broomsedge, running briars, and an occasional scrub pine, to say nothing of the fact that the patch had not been plowed for at least a decade or two.

What has happened to focus widespread attention on this piece of land? The answer may be a partial solution to the feed problem of the South. Each year millions of bushels of corn are shipped into the South to even up an inadequate feed supply. Why can't we grow enough corn to feed our cattle, sheep, hogs and poultry? Hasn't agricultural science the answer? The face-lifted broomsedge field on Brush Mountain is making an honest attempt to say, "Yes."

Early in 1947 the corn breeder, the plant physiologist, the statistician, and the agronomists in the Virginia Agricultural Experiment Station, together with a representative of one of the nitrogen companies, put their heads together and discussed what might be done to stimulate more interest in increasing Virginia's corn production. If a desolate broomsedge field could produce 80 bushels of corn to the acre, the campaign to establish a higher yield per acre corn program would be sold to Old Dominion farmers.

The Brush Mountain site was chosen in the face of open skepticism. "Too poor to sprout beans," scorned the neighbors. "Eighty bushels of corn on that land? It can't be done," laughed the landlord. This made us more determined.

Instead of setting their sights on 80- bushel corn to the acre, the scientists computed their requirements for 100-bushel corn to allow for a margin of safety. First the soil was tested, and

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found to be low in just about everything — nitrogen, phosphorus, potash and lime. Immediately, 1½ tons of finely ground raw limestone were spread before plowing and an equal quantity after plowing, a total of 3 tons. Being aware that 100 bushels of corn removes from the soil some 120 pounds of nitrogen, 60 pounds of phosphoric acid, and 80 pounds of potash, the super-corn growers worked into the seed bed 400 pounds of 2-12-12 fertilizer. This was broadcast. Four hundred pounds per acre of the same fertilizer were placed in the row at planting time.

Irrigation was impossible, consequently the water requirements were placed in the hands of the Almighty. Minor elements were thought to be present in ample quantities, and therefore disregarded.

The 800 pounds of 2-12-12 were uniform over the entire plot. However, the plots were so arranged that nitrogen, as a side-dressing, could be varied from 16 pounds of actual nitrogen per acre (this is the check plot) to 200 pounds of nitrogen per acre. A little figuring will show that the check plot received no nitrogen side-dressing, because this amount is present in the 800 pounds of 2-12-12. The second series of plots received 50 pounds of nitrogen per acre; the third series 100 pounds; the fourth and fifth 150 and 200 pounds of nitrogen per acre, respectively.

These nitrogen figures are actual pounds of nitrogen, and not pounds of nitrate of soda, or some other nitrogen fertilizer. For instance, the 200-pound nitrogen rate is equivalent to 1,250 pounds of nitrate of soda per acre. The nitrogen side-dressings were made when the corn was about one foot high.

One hundred bushels of corn would mean 14,000 ears, each weighing an average of one-half pound. Research shows that best yields are obtained by planting thick enough to produce eight-ounce ears. Therefore, enough seed had been planted to give at least 14,000 stalks per acre of the single-eared hybrid U. S. 13.

The corn was planted in early May with a two-row planter, and to insure enough plants, each row was planted twice by doubling back over the field with the planter.

Right after planting Old Man Weather dealt from the bottom of the deck, and as a result, on May 23 the first planting was destroyed and the field immediately reseeded. The second planting, although two to three weeks late, grew well and until it reached the one-foot height. At this point, the additional nitrogen was applied to all plots chosen to get the fertilizer in excess of 16 pounds to the acre. This brought renewed

vigor and color to the plots. However, it was not long until the corn growing on the 50- and 100-pound nitrogen plots fired. In contrast, at this writing (September 10) the stalks on the 150- and 200-pound nitrogen plots are a deep, beautiful green, shading to black, with a healthy ear on every stalk. Outside observers predict the yield will be over 100 bushels per acre on the latter plots, compared to 12 bushels or so on the 16-pound nitrogen plot.

The final measure will be actual field weights, of course, and not predictions; but already certain requirements for a maximum corn yield are strikingly evident; (1) enough nitrogen, phosphoric acid, and potash, the quantities of these nutrients to be supplied by commercial fertilizer will depend on the fertility of the soil, and ample amounts must be available for the growing plants regardless of the source; (2) an adequate hybrid; (3) a planting rate heavy enough to give enough plants to grow the desired yield, and (4) cultivation to control weeds, but avoiding deep or late cultivation.

New Winter Oat

If you live far enough south to raise winter oats, there's a new variety, called Traveler, you should know about.

It was developed in Arkansas, and already it's spreading into Oklahoma, southern Kansas, and Missouri.

To get the best results with winter oats, the ground should be turned in late July, and the seed sown from mid-September to mid-October. Oats sown early and heavy (three to four bushels an acre) make good winter grazing—well worth cost of land preparation and seed. It also keeps the land from washing or blowing.

This advice comes from H. R. Rosen of the Arkansas Experiment Station, one of the top authorities on winter oats. Rosen says Traveler oats on the Experiment Station farm yielded 106 bushels to the acre last spring. The land received a complete fertilizer before sowing on September 30, and was top-dressed with 100 pounds of ammonium nitrate in March.

Farm Journal

Twenty-six Years of Diversified Farming

Condensed from American Agriculturist

F. W. Beneway

THE purpose of this article is to review the successes and failures of twenty-six years of farming on one farm in Wayne County, New York. I believe that I have learned how to live and how to build a security on the land through diversified farming.

This operation began in 1921. I have kept a fair set of accounts each year since. In studying these accounts I have decided to divide the time into three periods.

During the first eight years from 1921 to 1928 inclusive, the net income averaged $2417.16. The lowest profit year was 1921, when the net income was $865.04 There was one loss year in 1926 when the net was a minus $1042.15. The highest profit year in this period was 1927 with a net income of $4624.52. The main income bearing accounts were apples, peaches and cherries. In order to show the relation of gain or loss to diversity, the cherry income of 1926 (the loss year) was $2504.63. If the cherry crop had not come to my rescue that year, my loss would have been much more severe, and with my small equity in the farm business at that time I might not have been able to weather the gale.

As time went on, and with my knowledge of Dr. Warren's farm management facts and figures, learned at Cornell when a student there in 1911 to 1914, I began to plan a wider range of diversity in each crop. I don't mean a little dab of this or that, but enough volume of each enterprise to fit into my labor facilities and the soil, climate and markets of the farm area. To illustrate, my gross receipts for 1928 were as follows:

Apples	$5414.90
Peaches	3149.06
Cherries	504.08
Poultry	1551.26
Pears	148.90
Prunes	298.25
Carrots	1152.45
Upland Celery	1116.30
Misc. receipts	126.66

So you see in the eighth year of the first period I had a gross income of $13,461.60 and by net income was $4009.39. During this period the work was done with one year 'round man besides my own labor and whatever extra help was needed by the day or piece work at harvest time.

The next ten years from 1929 to 1938, inclusive, were much the

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same in diversity of crops, with a net income averaging around $3000. The lowest income year was 1938 with a net of $61.63. There were no minus loss years in this period and the highest net income was around $7500. I also had built up a poultry flock of 500 to 600 layers which I could take care of myself at chore time and on rainy days. In all the twenty-six years, this flock has netted from $1 to $2 per bird, except that in one year it just broke even. I wish I could see in one pile all the manure and litter I have drawn on the land from the poultry house.

During this period, much lime and phosphorus were purchased and spread on the land. I had learned that poor soil grows poor people both mentally and physically, and we were raising a family. The phosphorus and lime went into the fruits, hay, grains, and vegetables. The family ate the fruits and vegetables, the cows ate the mineral-fed hay and grains, the hens ate the grains, the family ate the dairy products and eggs and the children grew the bone and muscle.

Now, to get back to the next eight-year period from 1939 to 1946 inclusive. These have been better years. The previous 8 years of planting orchards, building soil and better flocks, building some financial backlog, buying good equipment, life insurance to protect the family, and paying off some mortgage debt set the stage for larger income. The average net income for these past eight years has reached $10,000. Of course, war time prices helped a lot, but even these prices would not have done the trick without the previous 18 years of saving and planning.

The lowest net income in this period was in 1911, $1345. I need not disclose the highest because many would not believe it. Three of the children have grown up. Two have been graduated from Cornell, the third is a junior there now. The youngest is ten years old. The oldest son, 26, is in partnership with me on the farm. He has brought home a newer knowledge of mechanics, accounting and fruit culture and has purchased with his savings a one-half interest in all our stock and tools.

The diversity of this farm has been its strongest link because in the early days the family had to save and learn values. When the fruit prices were low or the crop failed, we had to learn how to pull in our belts and live from the hens, several cows and the garden. We never had to borrow too much from the banks. Credit is necessary to do business and is our most valuable asset. However the finest thing to learn about credit is not to use too much of it.

I do not believe in large scale one-crop farming. It may be necessary during war time, but who wants to live on wars! Such farming adds to surpluses and is too great a risk during years of adverse prices. The family-size diversified farm is much larger than it used to be because of better machinery, but it still should be circumscribed by a family venture. A good diversified farm requires more skill and knowledge to operate, but that is a healthy challenge to good husbandry.

I would like to set down some of the things a young man should consider in building a stable farm security:

1. Education and experience. There is no substitute for experience and education. This is a never ending chore or task, but the more one can acquire at the start, the better. There is dignity in acquiring skill and knowledge through the years. I oftentimes convince myself that if I had not studied at the New York State College of Agriculture, I would still be a tenant or hired man on the hills of Dutchess County where I grew up.

2. Climate. Climate is most important in relation to the crops one may raise. One cannot change a climate.

3. Good soil. Good soil is essential. However, one can purchase and return to the soil many of the minerals that are depleted.

4. Nearby markets. Nearby markets are a great advantage for perishable products. However, if one produces good quality, buyers will come a long way to purchase.

5. Good roads. Good roads are most essential. Volume production cannot be transported over poor and weak roads.

6. Cooperatives. Commodity group organizations and purchasing cooperatives are vital to modern agricultural production. No commodity group can progress faster than it develops its own leadership within its own ranks. No one will ever do for us what we can not or are not willing to do for ourselves. The farmer used to work with his eye on the ground like Markham's "Man With a Hoe." Since we have raised our eyes from the ground and learned how to work collectively in building grower-retailer-consumer cooperation, we have become more valuable citizens to our state and nation.

Let's Remodel Our Pastures

Condensed from Farm Science

M. L. Peterson and H. D. Hughes

You can double your grazing yields if you remodel that old bluegrass pasture. That's what we learned from a new series of experiments started 2 years ago in Monroe County. This land has been in permanent bluegrass pasture ever since the timber was removed many years ago.

We limed the pasture, and plowed it shallow about mid-November, early the next spring we put on phosphate fertilizer, then seeded several grass-legume mixtures with oats as a nurse crop. The oats were grazed off and provided pasture while the regular stand "came in." This last season a fine growth of bromegrass, alfalfa and red clover produced at least double the yield of the old bluegrass pasture.

This isn't just pasture renovation. It is complete remodeling. The results were even better than we expected. You can do the whole job without losing a year of pasture and without crowding your regular work schedule.

Permanent pastures are usually low in nitrogen. That is why legumes are a must in any good pasture stand. They build nitrogen in the soil to improve its fertility. Besides that, they have high feed value.

Sweetclover, red clover, alsike, alfalfa, Ladino clover, birdsfoot trefoil and Korean lespedeza all are good legumes for Iowa farms. To grow them successfully, however, many soils need lime and fertilizer.

Test your soil before applying lime. Be sure to put on the right amount. Too little lime won't increase your yields very much. Too much is a waste of money.

Lime your soil in the fall. If you're going to plow shallow, it won't hurt to plow it under.

You may need to add phosphate fertilizer in order to get full benefit from lime and other improvements. Most permanent pastures will need 200 to 300 pounds of superphosphate (0-20-0) per acre. Here again test your soil to see how much fertilizer you need. Apply it in the spring before seeding.

Bluegrass sod should be plowed in late fall (mid-November) as shallow as the plow will operate. There are several advantages to this: It helps winter-kill the bluegrass. It keeps lime near the sur-

Reprinted from Farm Science, Ames, Iowa, Oct., 1947

face. Late plowing avoids erosion from fall rains. It gets the job out of the way for spring work.

Disking may be more satisfactory than plowing on thin, weak-sodded pastures, or where fields are badly cut up with gullies and drainageways.

Early spring seeding is best. different combinations of grasses and legumes may be used, depending on the climate and soil. A good mixture is 6 to 8 pounds of bromegrass, 10 pounds of alfalfa and 3 pounds of red clover per acre. If your soil is not well adapted to growing alfalfa, use 5 to 8 pounds of sweetclover and 2 pounds of alsike clover along with the red clover and bromegrass. The Ladino is adapted to fertile soils which are well supplied with moisture. Birdsfoot trefoil and Korean lespedeza are suited to soils in southern Iowa.

You'll get better pasture if you let the oats get 8 or 10 inches high before pasturing them. You also may have to remove your livestock for about 6 weeks in midsummer.

If you can do without the pasture for a year, you may want to grow a crop of corn on the land before reseeding. This is a good way to pay for the new pasture. It may also permit you to seed down some other field that needs it and still not cut down your corn supply.

In plowing pastures, watch out for erosion troubles. You can get a good crop of corn on rolling land plowed out of pasture —if the grass sod is heavy and the slopes are not too long or steep. But even though you get a good yield, don't try a second year of corn. Erosion may be much worse the second year. You may not even get a stand of grass when you seed back to pasture.

Above all, follow the proven rules for controlling erosion. Plow slopes on the contour. Don't plow the natural drainageways. Where slopes are long and steep, plow strips along the contour, leaving alternate strips in grass. Once the new pasture is seeded down the remaining grass strips can be plowed.

Following several well-tested rules will help insure a good stand. First, use good seed. Quality is more important than price when seeding pastures. Inoculate all legume seeds. Be sure to get the right cultures for your seed. Preparing a good, firm seedbed will pay dividends in heavier stands and increased yields. Use a companion crop. It holds down erosion and controls weeds. Lighter seedings of the companion crop should be used if the crop is to be harvested.

Maybe your pasture is so cut up with gullies that you don't want to plow it. Well, you don't have to. You can get large increases in yield by renovating old

pasture. This does not kill out the old sod. Simply disk it so that the legumes may be seeded.

Old sod can be pretty tough sometimes. And here's a tip. Graze it heavily during late summer and fall. This will weaken the sod and make it easier to work up. Apply lime in the fall and disk it in.

If you need phosphate fertilizer, apply it early in the spring. Work it into the soil while fitting the seedbed. Do a thorough job of disking. More light stands are due to poor tillage than any other cause.

Seed early. Not later than mid-April. A good mixture to use is 5 to 8 pounds of sweet clover, 3 pounds of red clover and 2 pounds of alsike clover per acre.

You don't need to include a grass. The bluegrass will come back in.

In our experiments in Monroe County, yearling steers gained 79 per cent more per acre from pastures reconditioned in this way. This was a 3-year average under actual grazing conditions. In the 3 years 1944, 1945, 1946, the reconditioned pastures made a total of 217 pounds gain per acre more than the permanent pastures. The value of this extra gain was figured at $32. Total cost of lime, fertilizer and work for improving the pasture was about $18. It seems plain enough that the improvements more than paid for themselves in 3 years.

Pastures should be included in the regular crop rotation wherever possible. Rotation pastures not only give you more grass, but they also increase the yields of other crops. Rotations and mixtures must be fitted to the special needs of your farm. Bromegrass and alfalfa are filling the bill on many Iowa farms. Timothy and red clover are a good combination when seedings are left down only 1 year, and in areas where alfalfa is not well adapted. Bringing pastures up to date will increase profits from your farm business.

"Determine never to be idle. No person will have occasion to complain of the want of time who never loses any. It is wonderful how much may be done if we are always doing."

Thomas Jefferson

Rain Can Mean Riches or Ruin

Condensed from Successful Farming

Jim Roe

One lonesome raindrop isn't of much account.

If he's an average-sized member of his family, he's a little smaller than a BB shot—though more streamlined. He weighs only about one five-hundredth of an ounce.

But he has friends and relations. Lots of them. And he brings them all along. Some are fat, some skinny. Some are so small that millions of them only make a mist. Others are big and heavy—the kind that make a lot of noise on a tin roof.

In one good rain, a billion or more of these fellows will hit a single acre of soil.

They can make you—or break you. They can be absorbed and stored in the soil, then used by growing crops. Or they can pry lose the very best part of your soil—and bounce and wash it clear off the place.

What makes the difference? How hard they hit, in the first place; how large the drops are; and how many of them arrive. A nice, gentle, "soaker" type of rain has always made you smile—as it should. What you may *not* have noticed is what happens in your fields after a swiftly gathering downpour has caused you to make a desperate dash for the barn.

Raindrops don't hit bare soil and stay there. Instead, they knock loose some of the smallest soil particles, and bounce back up in the air as mixtures of soil and water. Again, one raindrop can't carry much soil. But a single heavy rainstorm can pick up more than 150 tons from each acre, and make it hop around the field like a jumping bean!

Most of those bouncing particles, of course, won't go far. They'll fall back down within a few inches from where they started. But if the raindrops are large and speedy, they may bounce as high as two feet. And they may travel sideways for five feet or more.

On a hillside, the raindrops strike at an angle. This means a lot more soil is bounced downhill than up. On even a 10-per cent slope, three times as much goes down as up. So, in rain after rain, the soil is bounced off the hilltops and down into the valleys.

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Even on level land, hard-hitting raindrops can make themselves pretty unpopular. They pick up the very smallest grains of soil. As this fine material falls back down to the surface, mixed with water, it starts to soak into the ground. But the fine soil in the mixture is caught at the surface, just as if it were going through a piece of fine filter paper.

As it catches, it fills the air spaces in the surface soil. It only takes about *two minutes* of brisk rainfall on bare ground until this process has almost completely waterproofed the surface of the field. Just as with a clogged filter, the ground can't soak up any more water. So there's nothing else for the rest to do but run off.

This isn't just a guess, for W. D. Ellison and some of his fellow workers in the Soil Conservation Service knew enough not to come in out of the rain. They stayed out there and made a careful study of what happened.

They found that one particular soil type would absorb six inches of water an hour, if the water was applied gently. But after hard rainfall had sealed the surface pores, that same soil would soak up only a *half inch* an hour. Water can be merrily running off your fields, while roots are drying up just below the surface.

If your fields are level, you won't see so much evidence of this runoff. Unless you take a careful look, you might miss seeing the little stones and twigs perched up on their pedestals of dirt. They have protected the soil beneath them from the beating raindrops, but the unprotected soil nearby has disappeared.

Some of it is down, filling the pores of the soil that's left. Sheet erosion took the rest. You can quickly see gully erosion, for its tracks are plain. Sheet erosion is sneaky. But its effects are just as bad.

It would be bad enough if you lost just the water. If all the rains of early summer run off, there won't be any water stored for the dry times. But those raindrop splashes add insult to injury.

By hitting the ground and splashing back up, the clear rain water is changed to muddy water. And when muddy water runs off a field, it acts just like sandpaper, grinding still more soil loose. And new raindrops, hitting this muddy-surface flow, keep it agitating as if it were in a giant washing machine.

Ordinarily, much of the soil in the water would settle out as it flowed across the field, but the repeated blows of the falling drops keep it in suspension.

Only the coarse, gravelly grains are left. And if the rain is hard enough, they will go, too.

Now then, it's always very interesting to know just how your pocket is picked. But it's not too

helpful unless you also learn how to outwit the thief next time. Fortunately, we know how to do this.

The trick is to slow down those speeding drops. Then they won't bounce, and can soak into the ground as clear water, instead of muddy. Clear water doesn't clog the soil's pores. It soaks in, and will be there when your crops need it. And the soil will stay in place.

How to do it? Use cover crops, mulches, and increase the humus content of the soil.

Some crops — small grains, grasses, legumes — spread and cover the ground fairly quickly. Others, such as corn and beans, are pretty slow at the job of building an umbrella over the field. It is more than just a coincidence that these crops which fail to cover the ground well are known to be hard on the soil. Part of that damage is due to the rough treatment that raindrops dish out to the unprotected soil.

Your first job, then, is to put as much of your farm into grass as you can. Especially hilly fields. And the most "splashable" areas. Sand splashes much more easily than clay—but once the tiny clay particles are pried loose, they are carried farther than are the coarser bits of sand. Where you don't want sod, try to keep a cover crop on the field over the winter. Rye, ryegrass, or sweet clover sown in corn at the last cultivation protect the soil and make a plow-down, green-manure crop for spring.

Plant corn and beans with the rows crosswise to the prevailing storms. Some tests have shown that a field of corn whose leaves catch only 50 per cent of the water—when it falls from straight above—will catch up to 90 per cent when the wind blows at an angle. Crosswise planting will take advantage of this.

Overgrazed pastures are easy victims of rain. The roots don't do much good, for the raindrops hit the unprotected *surface* of the soil.

If subsurface tillage is practical in your section, use that method to leave a mulch of crop residue on the surface of your fields. A *good* mulch is nearly as effective in slowing down speeding raindrops as a cover crop. In some areas, though, mulches will sometimes depress yields.

Finally, build up the organic matter in your soil. A well-ventilated soil, with good tilth, won't break down as easily under pounding rains. Its surface pores won't clog as quickly. And it can soak up more rain than can a tight soil.

You can't have cover crops or mulches on all your fields all the time, and a soil in good tilth will spread out the welcome mat for all but the very worst rains.

We never get just the amount of rain we want. There's always too much or too little. Happily, one set of treatments cures both pains. Grasses and legumes, trash mulches, and organic matter can handle excess water—or can make the most of each scarce raindrop.

New Lespedeza

Korean lespedeza may soon have a more prominent place along the northern limits of its adaptation area. This is because of a new, early-maturing variety, known as Iowa 6, which is being released this spring by the Iowa Agricultural Experiment Station. Only 3,500 pounds of the new variety are available.

This will be distributed for seed production to farmers in 23 southern Iowa counties. Growers receiving the seed agree to plant it on a field free from primary noxious weeds, and will handle the crop for seed production.

The new variety is 1 out of 81 lines selected and tested over a period of seven years. Its superiority over the ordinary Korean lespedeza lies primarily in earlier maturity. It also shows slightly greater resistance to bacterial wilt.

When grown as far north as the central part of the state, Iowa 6 yields better than ordinary Korean lespedeza, but this may not be the case when grown further south.

Iowa 6 promises to fill the place station agronomists hoped would be filled by the Early Korean lespedeza 19604, which was released in 1923. But almost immediately after the early variety was distributed, a bacterial-wilt disease made its appearance. The early variety was found to be extremely susceptible to the disease, and as a result of this, it was never widely used.—Maurice L. Peterson, Iowa State College. *Successful Farming*, Oct., 1947

The Spice of World Trade

Condensed from Nation's Business

Lawrence Galton

SPICES don't look like much. Ask any group of people to name the world's most fascinating trade and there'll be any number of answers: steel or stockings, whaling or wire recording, plastics or plumbing.

Spices won't be mentioned; they hardly seem important.

Yet in January, 1942, just a few weeks after Pearl Harbor and seemingly no time to be worrying about cinnamon for apple pie, one of the country's top research organizations, already ladened with vital war projects, made room for one more: to find an imitation cinnamon to replace the supply cut off by war.

In California some months later, when poppyseed imports had stopped, a group of farmers tried to plant that spice. Federal anti-narcotic laws said no — too easy to get opium from raw poppyseed. But it wasn't long before the farmers had state permission to plant 1,000 acres and had the governor and attorney general hard at work arranging for harvesting the crop under State supervision with special federal permission.

Even right now; one spice is heavily, and darkly, in the news. With pepper still short, racketeers are peddling a phony product containing cornstarch, salt, cottonseed hulls and just a dash of oil of pepper. Food and Drug Administration sleuths are huffing and puffing on the trail, seizing shipments and trying to discover the "brains" of one of the biggest frauds currently on the loose.

Spices may not look like much and, least of all, like the objects of a fabulous commerce. Yet their story has everything. Wars? Spices have caused them! Discoveries? Spices have fostered them. Amazing uses? Spices are noted for them.

Ever since civilization stuck its head up, the buds, seeds, barks and berries of a lot of aromatic and pungent plants have been almost as precious as, and far more useful than, gold and silver.

Remember the Bible story of the Ishmaelites who bought Joseph from his brethren? That little deal was arranged while the traders were bound for Egypt toting rich spicery. The Old Testament also recounts: "There

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came no more such abundance of spices as these which the Queen of Sheba gave to King Solomon." And the New Testament tells of the Three Wise Men who came seeking out the Child Jesus, bringing their gifts of exotic spices.

Four hundred and eight years later, 3,000 pounds of pepper were still precious enough to be a major part of the ransom demanded for Rome. And for centuries thereafter, not only were spices, even in small amounts, considered fitting presents for royalty, they were also used for taxes and rents.

As a matter of fact, you can thank Solomon for modern sales taxes since he imposed their forerunner—a tithe on spice merchants. And in eleventh century England, traders coming to deal in London had to pay a tax of ten pounds of pepper at Christmas and Easter.

An Historical Business

Spice men themselves are a peculiar breed. Many of them, even in America, are Dutch. And they come largely from families that have been in the business for generations. They look and act like practical business men.

There's nobody so quick as a spice man to belabor you with history. And no wonder. The spice trade has literally made history.

It was so rewarding in the thirteenth, fourteenth and fifteenth centuries when pepper cost $4 a pound and 16 ounces of ginger out-valued a sheep that the profits, particularly in southern Europe, fostered the building of empires, the growth of the arts and the construction of the great cathedrals.

And spices, no less, generated wars and discoveries. Spice-trade rivalry was back of the constant Middle Ages flare-ups between Italians, Spaniards, Portuguese and English. When the powerful Mohammedan federation controlled routes from the Near East to the spice islands, no Christian was permitted to navigate the Red Sea or to pass through the desert highways. The search for a new route sent Columbus journeying westward to discover America, others to find the passage around the Cape of Good Hope, and the Dutch and Portuguese to colonize the East Indies.

Nor does that end the saga. Chalk up, too, the early blossoming of the United States as due in no small measure to spices. The American merchant marine, although it mostly stayed away from India and the Indies where other nations dealt, opened up the China trade which led to the prosperity of early New England and, in turn, to the emergence of American culture in the 18th and 19th centuries.

Why such huge importance for spices?

It wasn't for just their seasoning value but for what today we'd call their bizarre uses. There was, for instance, the greedy hunger for ginger in the East—for its aphrodisiac qualities. Witches and magicians earnestly depended on burning coriander seeds for inducing hallucinations. And Middle Ages Europe prized spices for aromas which covered up foul odors in the non-plumbing era.

There was the use of spices for religious purposes, for incense and embalming, for sacrificial and funeral rites.

And there were innumerable medicinal uses as well. The Romans spiked their wine with spices to cure stings of snakes and scorpions. And European great-grandmothers hung spices above their pillows as a cure for epilepsy.

The most fascinating tidbit of all comes out of the year 1720 when the Black Plague was ravaging France. Along with it, as an almost equal scourge, was the activity of four daring thieves who went about unafraid, robbing the dead and dying. Although all France joined in the hunt, the robbers when finally apprehended were let off with light sentences in return for revealing their unusual secret: how they made themselves immune to the plague. The thieves had concocted a liquid composed of cinnamon, garlic, camphor, cloves, other aromatic spices, vinegar and wine. It was the antiseptic quality of this preparation that let them pilfer unplagued. This incident is supposed to have influenced later research in antiseptics.

But don't get the idea that the use of spices is any less variegated today—or even less bizarre. Pepper is, of course, still the refrigeration of the Orient. And in America, mustard peps up the hot dog and nostril-appealing spices provide the temptation in mince-meat, pumpkin pie, chili sauce, and the like. But, also, anise covers the disagreeable flavor of your cough medicine. And cayenne goes on your hair in tonics.

If you're in the second-hand fur industry and changing dog skins into "red fox," you'll be using turmeric powder for the "improvement." As a farmer, powdered fennel comes in handy for discouraging fleas in kennels and stables, and fenugreek does a job on livestock digestion.

Because a little spice goes a long way, the American spice trade isn't big business in terms of quantity. In 1939, the commerce totaled up to $60,000,000 annually. Before trade routes were blasted, ships unloaded

118,000,000 pounds of spice yearly at our docks.

We use about 30 different spices in the United States and practically all of them are grown in the tropical regions of the Orient. The islands of Madagascar and Zanzibar, off the coast of Africa, contribute certain spices, as does Jamaica in the West Indies. A few spices come from the southern European countries bordering the Mediterranean. But chief production is in the East Indies, India, Japan, China and the Malay Archipelago.

It takes tropical suns, rains and winds to store the rich aroma and rare flavor of spices. It also takes the patience of the tropical Oriental laborer to grow, harvest, cure and prepare spices for shipment.

All you have to do with cinnamon and cassia, for example, is to cut the inner bark from a tree just two years old. Then you have to strip those barks carefully, ferment them with tender care and pack them with loving hands.

Mace, too, is no snap. This exotic number grows as nothing more than a crimson network covering on nutmeg seeds. It has to be cut from the nutmeg by hand.

The same care is needed for other spices. Clove and caper blossoms have to be gathered before they bloom. Allspice berries and black peppercorns must be picked before they ripen.

Prior to the first World War, the majority of the spices from the Far East were still shipped first to Europe.

But with the war, direct service was inaugurated between Java and San Francisco, followed by similar service between the East Indies and New York. This brought an influx of Dutch brokers and the jelling of our spice trade in its present form.

Today spices are brought from plantation to New York in seven weeks, compared with several years transport 500 years ago. And the cost is now only a few cents, instead of several dollars per pound.

Most spices enter the country in the whole form. They are cleaned, sorted and graded. Then comes the grinding process in huge machines constructed to prevent escape of the volatile oils. Spice packers use a fine silk mesh to sift the ground products. This leaves the powder smooth and uniform for easy blending with other ingredients in cooking.

People who handle spices, particularly grinders, rarely have colds. That may be because the spices in the air toughen the mucous membranes of the nose and throat, making them almost impervious to germs. Or it may be the antiseptic effect of spices.

Similarly, butchers have no monopoly on rosy cheeks; grinders, too, are healthy-looking. They get their roseate hue from the little spice particles which are always in the air and which apparently keep the skin exhilarated.

Although the war has been over for some time, the spice trade still hasn't settled back to normal. During the war farmers in eight states went in for spice growing, but lower costs abroad are expected to make domestic production unprofitable except in a few cases. Another trouble is flavor, as with sage. Finest prewar sage came from the Dalmatian coast of Yugoslavia. Many spice dealers complain that American sage—grown in California, Massachusetts and Arizona—has a turpentine flavor.

One domestic product sure to go on, however, is mustard. A few counties in northern Montana now produce almost twice our total needs. Mustard growing there began only 14 years ago, expanded greatly during the war. When Amil Kleinert, pioneer Montana grower, first started raising his crop, his neighbors thought he was developing another type of noxious weed that would infest wheat fields in the area. It wasn't safe for him to go out of doors at night, even in the year 1931, until he proved that cultivated mustard doesn't survive over the winter in the soil and is not a threat to succeeding crops.

The big trouble in spices right now, however, is the import situation, particularly in pepper.

When the Japs invaded the East Indies, which once supplied 85 per cent of the world's pepper, they cut down pepper trees by the millions to make way for other crops and military installations. They also took workers away from the pepper plantations and let the remaining trees become choked by rank jungle undergrowth. As a result, world pepper production this year is one-third of normal.

Meantime there's a 10,000 ton stockpile of pepper on Bangka, an East Indian spice island. The Netherlands Indies Government, which controls legal export, has been too busy with revolutions in Java and Sumatra to worry about pepper. Pepper smugglers have taken over, carrying on a lucrative if illegal pepper-running trade between Bangka and Singapore. All of which leaves the average American housewife gasping for a sneeze, paying 80 cents a pound.

With the exception of pepper, however, the spice trade is expected to be back in full swing this year.

When spices are swinging high again there's likely to be a marked increase in their use. For

one thing, in the late 'thirties, the Nobel prize was won by a Hungarian scientist who found that paprika is the world's best source of vitamins C, P and K. Subsequently vitamins in plenty have been found in red pepper and cayenne.

Millions of service men have come back with a new appreciation of the tongue-titillators. Early in the war, the Army made tests in which one group of soldiers received spice-flavored food while a control group got equal quantities of unflavored nourishment. Results showed that spices increased stamina. So the Army has made heavy use of spices in the mess halls.

Similarly, travel and dining in strange lands where spices are cooking essentials are expected to increase the demand.

What Will Formula 144 Do?

Condensed from Turkey World

Dr. D. F. Eveleth
North Dakota Agricultural College

THERE are several diseases of the digestive tract of turkeys that are caused by single celled organisms called protozoa. Among these are listed histomoniasis or blackhead, hexamitiasis, trichomoniasis, and coccidiosis. There are also other protozoan diseases which may in time become economically important.

Control of these diseases is for the most part based on good nutrition and rigid sanitation. *If the Turkey grower could and would use the information available on sanitation, it is doubtful if he would ever lose any birds from infections by the protozoan parasites.* Good nutrition of parent stock, proper incubation and brooding, good nutrition of baby poults, all conducted under rigid sanitary rules, would probably result in raising turkeys entirely free from disease.

But the grower may introduce infection on contaminated feed sacks, and in some cases, where poults are raised in complete isolation from other farmyard poultry, they can easily become infested with cecal worms from pheasants (unpublished observations by Goldsby).

The cecal worm egg is one means of transmitting blackhead from a carrier bird, infested with both cecal worms and the black-

Reprinted by permission from Turkey World, Des Moines, Iowa, Oct., 1947

head protozan, to non-infected poults.

Whenever a disease, whether bacterial or protozoan, is introduced into a flock, it has an opportunity to multiply in the first birds affected, and in this way build up enough infective material to cause heavy losses.

The turkey grower must make use of all available means in combating disease. All successful turkey producers use good rations, proper brooding, and rigid sanitation. Still it is not uncommon for them to encounter serious outbreaks of hexamitiasis, coccidiosis, histomoniasis, and trichomoniasis. Diseases produced by these four types of organisms are widespread, and it is doubtful if there is any locality that is free from all or any of them. Coccidiosis of turkeys is not generally considered a serious disease of poults, but in certain cases, the evidence definitely points to coccidiosis as a serious disease.

For the most part, medicinal control of protozoan disease has been disappointing to those who have tried it. It is well known that phenothiazine will remove adult cecal worms from turkeys, but Wehr and Oliver have found that this drug will not remove the immature forms of the cecal worm.

If phenothiazine is to be used in the control of blackhead in turkeys it must be used at frequent intervals. It has not been established that the cecal worm is the only means of transmitting blackhead from turkey to turkey. The evidence available indicates that this is not the only way in which blackhead is transmitted. Certain experiments show that blackhead may be transmitted directly by the droppings of an infected bird contaminating the feed or water of susceptible poults.

The actual treating of birds infected with blackhead has, in general, been ineffective. One drug, mapharsen, has been found quite useful by certain investigators, and useless by others. Trials reported from this laboratory indicate that when this drug is used early, it is very useful in saving birds showing symptoms of blackhead. It must be realized that many birds infected with the blackhead organism make recoveries without medication; in fact they may have such a light attack of the disease that they show no symptoms.

Various investigators have shown that in all the protozoan diseases of the digestive tract, at some stage of the life cycle of the parasite it existed as a free living parasite in the lumen of the gastrointestional tract. Any medicine that would be effective in controlling or killing these protozoa would either have to

contact them while they were actually in the tissue cells or while they were in the free living stage. The action of arsenicals appears to be directed in both directions. Injected arsenic attacks the parasites in the tissue, while arsenic in the feed or water attacks the free living forms. In our experience, arsenic in the food or water constitutes a serious hazard to the poults because of the frequency of arsenic poisoning in our experiments.

Formula 144 Is an Ammonium Compound

Many of the quaternary ammonium compounds are distinctly bacteriocidal. They are useful when in solution of water in killing many of the common disease-producing bacteria. Experiments in mixing one of these compounds with material containing histomonads and trichomonads showed that the quaternary ammonium compound quickly caused the protozoa to quit moving. One of these compounds was selected for more complete study. Its chemical name is di-isobutyl phenoxy ethoxy ethyl di-methyl benzyl ammonium chloride, but it has been assigned the trade name of Formula 144.

Formula 144 in the drinking water, in dilutions of 1:10,000 to 1:1,666, has been tried in various field outbreaks of blackhead, trichomoniasis of the upper and lower digestive tracts of turkeys, and in outbreaks of coccidiosis in chicks and poults. The evidence obtained indicates that under most conditions a dilution of 1:5,000 of Formula 144 will prevent the rapid multiplication of most protozoa in the digestive tracts of birds. This does not mean that in those cases where there is considerable damage to the liver or ceca or intestine that Formula 144 will be effective in curing the individual. Our cases point to the opposite conclusion. If a bird is visibly sick with blackhead, it will not be benefited by Formula 144. On the other hand, many cases of chronic coccidiosis in chicks and coccidiosis in poults have recovered following the use of Formula 144 in the drinking water.

One rather interesting case of a turkey tom may illustrate the protozoacidal action of Formula 144. A new tom was introduced into a flock of hens. The tom soon developed a pendulous crop and became visibly sick. Material from the crop showed many trichomonads. He was placed in a pen by himself and given water medicated with Formula 144. The next day there were no active protozoa in the crop contents. The tom died, but at post morten examination it was impossible to show any active protozoa in the crop contents. Prolific ulcerations had completely closed the open-

ing from the crop to the proventriculous and the tom apparently starved to death.

The data which we have collected in two years of intensive investigations indicate that when Formula 144 is used in dilutions of 1:5,000, or less, it does not greatly interfere with the normal growth of poults. *It acts as an inhibitor to the spread of the various diseases, but is not of any value in the treating of advanced cases of blackhead in turkeys.* Its value in intestinal coccidiosis, both in chicks and poults, appears to warrant its further trial.

Use Extra Soil Fertility to Provide Protein

Condensed from Guernsey Breeders' Journal

William A. Albrecht

University of Missouri, Columbia, Missouri

THE very mention of the word "protein" calls to one's mind the problem of providing this essential part of food and feeds. In the kitchen, the lean meat is the first protein the housewife thinks about in her efforts to supply for her family a diet that is not deficient in this respect. On the farm, the word "protein" connotes blood meal, tankage, and other animal offal, or the many "meals," including cottonseed, soybean, gluten, bran, shorts, and other milling by-products. Whether it is a matter of feeding people or feeding live stock, the provision of plenty of protein is the first desire, but one not so simply nor so cheaply accomplished.

Supplying protein is a decidedly difficult problem in contrast to the ease of producing plenty of carbohydrate. Carbohydrates are readily and widely grown. But when it comes to the proteins they are so much less common that we think first of them as purchased supplements. In the distant past the pioneer grew them. In the recent past their ample supply on the market has permitted ready purchase. But

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very recently, compelling economic conditions are apparently bringing us more and more to think about growing our own supplies. This is necessary in order to balance the carbohydrates and get extra margins of profit in having both as home-grown products.

Such will, of course, solve the problem of buying proteins but at the same time it will bring into clearer focus the necessity of putting fertility treatments on the soil. Fortunately, such rebuilding and conservation of the soil for the future not only provides protein now more cheaply, but also looks forward to make one highly independent of any market for his supply of it. We need more folks among the producers of milk and the growers of meat—which are our best protein foods—who will think more about providing most of their needed protein by building up the soil with its resulting conservation as an added profit.

Growing one's own protein, however, is not so simple a matter. The vegetable proteins we purchase are mainly seed parts. The yields of these per acre are determined by the fertility level of the soil. Making protein is a part of the plant's struggle to reproduce itself. Even for the plant, this is not a simple task. Legume forages and the seeds of those like peas, peanuts, and beans are relatively rich in this requisite food constituent. But the high concentration of protein in the seed demands its having been first synthesized and put up in the forage part of the plant before it is localized and concentrated in the seed of the crop. Hence, the forages and hays of legumes, too, are rich in protein. It is this property that makes them good feed for the young or growing animals. However, legumes do not grow well nor do they manufacture much protein per acre, unless the soil supplies them generously with calcium, phosphorus, potassium, and the others of the soil-borne essential mineral elements that serve not only in the physiology of the plant but also in the life processes of animals and man as well.

All plants manufacture carbohydrates in fairly generous amounts. These are the basic compounds building up the plant body. The very growth of the plant spells carbohydrate construction. This process takes its necessary raw materials from the air as carbon dioxide which is combined with water through the power of the sunshine. Some few contributions and in small amounts, including potassium, magnesium and iron are needed from the soil. But these serve only as helpers or catalysts in the construction process. They do not occur in the final or resulting

carbohydrate compounds like sugar, starch, cellulose and others. This is the process of photosynthesis operating almost wholly on air and water as the raw materials that bring themselves to the plant and hence represent very little of a struggle by it. It is they that build the plant factory and serve as its fuel supply.

Proteins, in contrast, are not so simple in chemical composition, nor are they so abundantly synthesized by the plant. Carbohydrates seem to be the starting point for their construction. This conversion is brought about not by sunshine power but rather by the "life" processes of the plants. Proteins vary widely in their chemical composition. They are still kinds of mystical chemical compounds as to their particular structural make-up. There are infinite kinds of them too. We know they are combinations of complex compounds called "amino acids," which are the simple building stones or structural parts of all proteins.

Unfortunately, these amino acids cannot be synthesized either by the animal or the human body processes. We and higher animals below us all depend on plants to synthesize these for us from the simpler elements. The plant, in turn, is highly dependent on the soil fertility, that is, calcium, phosphorus, nitrogen, and other nutrients, for help in synthesizing them. These amino acids are the components of its own proteins within which alone the life processes of cell multiplication or growth can be carried forward.

For carbohydrate production the soil must provide the plant mainly with potassium. For protein production more than this rather common element of soil fertility is needed since the plant's construction of sugars, through the help of potassium is the forerunner. Seemingly these sugars are both the raw materials and the energy source from which amino acids and their combinations as proteins are built up by the plant. But this is possible only when many additional soil-borne minerals are also provided. The chemical structure of amino acids suggests that they might have initially been sugar-like compounds into which some nitrogen, some phosphorus, and some sulfur are connected. But this protein compounding process —unlike sugar production—does not proceed under just sunshine power. It goes forward in the dark. It is powered through combustion of some carbohydrates or through a process that may well be called biosynthesis or "life" synthesis rather than photo-or "light" synthesis as is the case with carbohydrates.

Even though calcium is not a

chemical part of the resulting protein compounds, it plays its important roles in their synthesis. We must have calcium or lime present for—and connect it with—protein production by plants much as potassium is connected with carbohydrate production by them. So when we need to lime the soil for legumes we now know that we are not fighting soil acidity, but rather we are fertilizing or supplying some soil fertility by which we grow more protein more effectively along with the production of carbohydrates. More fertility in the soil is the means by which plants do more than make energy feed values in their carbohydrates. It is this means, contributed by the soil rather than the weather, that makes protein synthesis possible. Growing our own protein means less attention to the weather and more concern about treating the soil with manures.

Unfortunately, we have not appreciated how important soil fertility converted into protein is in the process of multiplication of cells or in any of the processes of reproduction and growth. Protein is also protection against disease in the body's resistance. Better soils for better feeds to give better bearing of young, better milk production and better health has not been our thought so much as have more feeds for increasing the body weight through laying on of fat. Likewise in thinking about fertilizers and other soil treatments for crops, our measure of their efficiencies has been the increase in plant bulk. We have not looked to the better food quality in the crop that was given lime or other fertilizers on the soil growing it. Instead we have been satisfied with more quantity or more tons. In milk production, too, the value of protein supplements has been measured mainly in more gallons (mainly water) of milk, or more pounds of butter fat, which is an energy food. We still don't measure their effects in the pounds of protein output in the milk as brought about by the protein input of the feed. Quality of forage feeds in terms of better body growth, better reproduction, better meat or better milk in solids-other-than-fat, has not yet become the main reason for our closer attention to growing more and better proteins rather than buying them. Such qualities have not yet been appreciated as the more deeply significant reason for building up our soils to a higher level of fertility.

Is Your Farm Safe from Fire

Condensed from The Michigan Farmer

Fred W. Roth

WHILE you eat supper tonight, 4 other farm families will be fighting a raging fire. Every 15 minutes, fire starts on some farm in the United States—100 every single day—40,000 per year. If all the farm fires which occurred last year were burning simultaneously with 16 fires per mile along a transcontinental highway, there would be an unbroken band of flame stretching from Los Angeles to New York City. More than 3,500 farm people died in these fires during the year, an average of 10 every day.

Each such incident spells tragedy for one farm family, but attracts brief mention, because few such fires ever come within the range of observation of many people. There is never a sweeping conflagration of large magnitude on the farms such as would win wide publicity from the press and give the subject standing in the public mind. There is always isolation—a farm fire here and another far away. For this obvious reason, the magnitude of the fire losses on the farms of America is not generally recognized, not even by the farmer himself. This same reason explains the indifferent attitude toward fire-prevention efforts and the philosophy of "it won't happen to me."

We are burning up our resources at an alarming rate. The replacement of the buildings destroyed requires the cutting of 5,000 acres of our forest each year. This at a time when our timber supply is dwindling at an ever increasing rate.

Replacement in nearly every case requires an outlay quite in excess of the insurance proceeds, if indeed, there was insurance coverage.

In addition there is the necessary investment of time and labor on the part of the farmer in the rebuilding process. The temporary loss of use of the farm equipment which was destroyed is often a matter of serious concern for the reason that the buildings and their equipment on farms are the manufacturing plant of the farming business.

The farmers' annual loss from fire will build 50,000 barns at $2,000 each and these structures, stood end to end, would form an unbroken wall 500 miles long. At

Reprinted by permission from The Michigan Farmer, Detroit, Michigan, Oct. 4, 1947

$5,000 each enough houses could be built to house a population of 100,000 people.

Agriculture can ill afford such wasteful destruction. It is a tax upon every bushel of grain the farmer hauls to market; upon his dairy and poultry products; upon his livestock; upon all his efforts. Though he may be unconscious of the fact, this toll is levied upon every day's work. How else could insurance losses be paid?

The encouraging aspect of this problem is that fully 90 per cent of the fires on farms could be prevented and this is an ideal time for every farm family to give serious thought and attention to the things which can be done to reduce the danger of fires.

The records of fire losses show that if 5 structural hazards were corrected, the number of farm fires would be cut in half. These are listed here for your guidance in checking your farm and home.

I. A lightning protection system properly installed and maintained is practically perfect protection. All main buildings need to be protected by grounding metal roofs or installing lightning rods. The lightning rod systems on many farms need attention and additions to make them effective. Grounds must extend to permanent moisture and all connections should be tight. Masses of metal within buildings, such as hay tracks, I-beams, and milking machine piping should be interconnected or grounded separately. The electrical system should be properly grounded.

2. Stoves and furnaces should be installed to provide proper clearances from walls and ceilings. Set them on a fire-resistant base. It is wise to enclose the heating plant in a separate room with fire-resistant walls and cover the ceiling with plaster, gypsum board or other fire-resistant material. Defective equipment should be properly repaired or replaced.

3. Use a fire-resistant roofing such as good quality composition shingles, slate, asbestos, metal or other fire-retardant material when re-roofing. If you have wood shingle roofs keep a spark arrestor on the chimney.

4. Inspect the chimneys for cracks or other defects, and to clean them. Repairs should be made before the heating season gets under way. New chimneys should always be built from the ground up resting on a solid foundation. The correct size is important, and flue linings should be built in unless the chimney is made 8 inches thick. No woodwork should be built in or on the chimney.

5. The wiring system is overloaded on many farms and should be remodeled to provide sufficient capacity as well as safety. When lights flicker and the

proper size fuses continually "blow," it is usually a sign of danger. It is good fire insurance to have a competent electrician bring the electrical system up to date and install plenty of outlets.

In addition to the fires caused by faulty construction, many others are due to the actions of people. Public Enemy Number 1 is the careless smoker. He smokes in the barn and in bed, and he carelessly throws away lighted cigarettes and matches.

The thoughtless housewife ranks second on the list. She stacks papers, magazines, old clothing, discarded furniture and oily rags away in the attic, the closets, the basements, and the outbuildings when the house gets full. This debris is perfect tinder for any spark and is often the source of spontaneous combustion. She burns houses by using kerosene to start fires, by dry cleaning with flammable liquids, and by leaving the electric iron plugged in.

Her husband is equally careless. He doesn't clean the dust and cobwebs around motors, and switches. He fills the tractor while the engine is hot and running. The gasoline storage is closer than 50 feet from a building. He brings in the hay before it is sufficiently dry, then he neglects to watch it for heating which may take place.

The purpose of Fire Prevention Week is to call attention to the common fire hazards and suggest the means of eliminating them. Any time and effort spent in eliminating hazards is an investment in increased security.

Every farm family must recognize their responsibility in doing everything possible to prevent fires, and help to reverse the upward trend of fire losses.

Hay Crusher

Condensed from Pennsylvania Farmer

Franklin P. Ferguson

In attempting to improve the quality of hay and to speed haymaking methods, the crusher is a machine which seems to have been neglected. This implement, consisting largely of a pair of heavy rollers between which the newly cut grass passes, does not really crush the plants, but only splits the stems, a process which allows for more ready release of moisture.

Reprinted by permission from Pennsylvania Farmer, Pittsburgh, Pa., Oct. 11, 1947

A report issued by the Pennsylvania Agricultural Experiment Station a decade ago reads: "The use of the hay crusher promises to reduce the loss from spoiled hay. In general, it reduces the curing time by one-half, as compared to uncrushed hay. No disadvantages have been observed except the high price of the present machine. . . ."

Dr. C. B. Knodt, Station dairyman, and other experiment station workers have a great deal of confidence in the practicability of this machine. A commercial model put to use this year in making hay for The Pennsylvania State College dairy herd attracted wide attention. Records taken by Dr. Kondt in midsummer during haymaking confirmed his belief in the usefulness of the hay crusher.

Two trials were conducted on second cutting alfalfa which yielded slightly less than one and one-half tons per acre. The average temperature on July 29, the day of the first trial, was approximately 82 degrees Fahrenheit, and the relative humidity was 43 per cent. Under these conditions three lots of hay which were not crushed averaged 74 per cent moisture at cutting and 40 per cent 8 hours later. At the end of 27 hours these lots still contained 29 per cent moisture and were hardly dry enough to be put in a mow safely. Three other lots which were crushed averaged approximately 73 per cent moisture at cutting. At the end of 8 hours they averaged slightly less than 31 per cent moisture, still too much to allow the hay to be safely stored but nearly 10 per cent less than the uncrushed lots.

In a similar trial on July 30, when the temperature averaged 85 degrees and the humidity 43 per cent, two lots of alfalffa which were not crushed averaged roughly 79 per cent moisture at cutting. At the end of 6 hours, they were down almost to 43 per cent moisture. Two other lots which were crushed averaged a half per cent less moisture at cutting. This hay was down to 26 per cent moisture and was ready to be stored at the end of 6 hours. Approximately six tons of hay were made in each trial, and experiments are planned to determine possible differences in feeding value.

Infra Red Heat Cuts Cold Losses

Condensed from The Western Farm Life

Carl E. Hayden

THAT thing that looks like a series of suspended hotcakes is the answer to economical frost damage prevention. In a few years the odd appearing devices may be as common in truck gardens and fruit orchards as sunshine.

And what a God-send it will be to the fruit and nut growers who now blacken the sky, as well as the landscape and citizenry, with smoke from heaters commonly called smudge pots.

Developed and tested on the experimental farm of the Michigan State College, the tower of vanes is described as "an oil burning heater, operated at a cost of 75 cents per hour, that sends out infra-red heat rays and keeps plants 8 degrees warmer than ordinary outside temperatures."

Success of the "over grown gadget" was announced by V. R. Gardner, director of the college's experiment station. Work on the project was directed by Arthur W. Farrall, head of the section of agricultural engineering, assisted by W. H. Sheldon and Clarence Hanson. Experts of the Detroit Edison Company and members of the research committee of the board of commerce cooperated.

Experimental models will be further tested this next spring. Building of commercial types will follow.

Infra-red heat carries the energy direct from the heater to the plants and soil without the necessity of using the air as a medium of heat transfer. Extra heat is not required to warm the tremendous amount of air between the heater and the plants.

In tests last spring electrically operated radiation device, aluminum reflectors, with red type chromolox electric heating elements, were constructed 10 feet off the ground. Thermometers were placed on the plants, beneath the ground and suspended in the air at different parts of the test area. Other thermometers were placed outside the protected area.

On three different nights, vegetation inside the area was kept from 6 to 8½ degrees warmer than in the unprotected areas. On the coldest night, temperatures of the vegetation outside the test area dropped to 23.5 degrees, but inside the area the infra-red rays

Reprinted by permission from The Western Farm Life, Denver, Colorado, Oct. 1, 1947

kept plants at 32 degrees and prevented frost damage.

Initial investment and power costs for electrically operated equipment are high because transformers are needed. Except for high dollar per acre crops, the method would prove too expensive. Tests, however, convinced Farrall and his associates that infra-red radiation was the answer to frost protection. They then sought a cheaper method of producing the energy needed.

An oil heated unit was constructed. It consisted of an oil burner with a heater tube which operates at low red heat. A series of special type aluminum reflectors directed the heat down against the crop to be shielded. The unit, in its first night of testing, consumed 50 gallons of kerosene during 7.6 hours of operation and radiated 872,000 B. T. U. per hour. It held temperatures to 37 degrees, while outside the test area the thermometer dropped to 29 degrees.

No figures are available on the cost of the device. Costs will depend on whether it is a small unit for the garden or one intended to cover 2 or 3 acres. Costs will also depend upon whether parts are assembled and built by the farmer himself or constructed in volume by a manufacturer.

The test apparatus, which was mounted on wheels and had other features needed to obtain experimental data, actually cost about $250. Engineers believe that a practical farm unit, large enough to protect an acre, can be built at about one-third to one-half that price. It would be mounted on skids and without special experimental features.

Late spring and early fall frosts cost farmers millions of dollars annually. In a few hours, a single frost may wipe out a $500 per acre berry, fruit, mint, truck, flower or other high value per acre crop. It is estimated that in Michigan alone, frost damage loss runs as high as $20,000,000 in some years. Citrus crop losses in California and Florida are often much higher.

Such damage is usually caused by temperatures slightly below freezing that occur one or two nights at the beginning or near the end of a crop season. For example, Michigan had a killing frost in some areas September 2 last fall. Had tomato and melon growers been able to protect their crops for about 2 hours that morning, they would have had 4 more weeks of favorable growing and harvesting weather. But many lost their crops in that comparative twinkling of time.

Then, too, infra-red heat rays are recognized health builders.

At present fruit growers have to rely on a large number of small heaters scattered through-

out the orchard and designed to burn either solid fuel or oil, to prevent frost damage. Those are mainly effective in heating the air by convection to a safe temperature. They also protect by radiating heat which is absorbed by the fruit trees. This feature is important on nights when a warm layer of air does not exist above the tree tops. This is not necessary with an infra-red heater. Infra-red heat carries the energy direct from the heater to the plants and soil without the necessity of using air as a medium of heat transfer. Therefore, extra heat is not required to warm the tremendous amount of air between the heater and the plants or trees.

The heaters used today will burn most types of oils, including kerosene, distillate, deisel and the heavier oils. Some of these oils are expensive and dangerous to use. With the present conventional pots, 35 to 50 are needed per acre for sufficient heating. However, with the oil burning, infra-red heater only one to the acre is required and the trouble and danger of firing many heaters is eliminated.

One disadvantage that the infra-red heater has is the fact that the temperature of surrounding vegetation and plants must be taken as well as that of the orchard or fruit plot to be heated. Accurate air temperatures are needed with conventional pots to determine just when to fire up and save a fruit crop from frost damage. But with the infra-red machine actual temperatures of foliage inside and outside the orchard in question have to be determined. As pointed out before, the infra-red heaters warm the trees and plants themselves but not the air. The present infra-red model is constructed to use kerosene, which is both expensive and dangerous. Extra records on air temperatures will probably be a necessity with the infra-red heater because air temperatures usually predict frost.

All of this is time-consuming work and indivdual growers have no doubt had the experience of saving a fruit crop from frost damage only to have it sell at a loss. During a period of 15 years of heating at the fruit sub-station at Austin, Colorado, it has been found that in between the two extremes of losing 1 out of every 10 crops to 8 out of every 10, most growers will find it profitable to heat peaches, apricots, other soft fruits, and possibly apples, depending upon market conditions.

How Much Lime?

Condensed from Missouri Ruralist

William B. Raufer

SCIENCE again has made a development which will benefit farmers. This time it is the Limemeter, used to test the lime requirement of soils. It was invented by C. M. Woodruff, of the Missouri College of Agriculture.

The Limemeter promises to be a more accurate method of testing soil samples for lime needs. Results so far indicate it shows the actual lime requirement of the soil without variations between soils of different textures. Previous methods required measuring color intensity of the chemical solution in which the sample had been placed. Soil experts found colors may vary with different soils, even tho lime requirement may be the same.

The Limemeter shows the lime requirement on a dial, regardless of the soil texture. This makes for greater accuracy and means money in the farmer's pocket. He'll know better whether or not he is applying the right amount of lime to his land.

The Limemeter is a small compact machine. It consists of a metal box, less than a foot square, with 2 glass electrodes attached by covered wires. Then there is an electric cord attached to it.

The mechanism is quite foolproof, from its use so far. The operator weighs out a 5-gram sample of air-dry soil, pulverizes it, and places it in a beaker or small paper cup. He then adds some water, adjusts the machine, inserts the electrodes into the beaker or cup, and reads the dial. That reading will give the acidity of the soil. By taking another sample, adding water to it and a special chemical solution, another test is run. This time the lime requirement in pounds per acre is shown on the dial.

Three of the machines were installed in county agents' soil-testing laboratories a few weeks ago.

County agents using the Limemeters report the machines are easily handled, simple to operate, and much more accurate than previous methods used.

Like other worthwhile scientific developments, the Limemeter promises to do its part in helping improve soil fertility. This will result in better crops, livestock, and farms.

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Get 'em off to a Flying Start . . .

Condensed from Hog Breeder

E. L. Quaife

In any well balanced program for swine production, all factors which influence costs must receive their fair share of attention. Poor breeding stock in the hands of a good hogman may actually give better results than the best of breeding stock poorly cared for, but the goal is the best of breeding stock well cared for. Let us look into these factors.

The weight of a litter of pigs at 56 days depends much upon the milk flow of the sow, and the milk flow is influenced by feeding as well as by heredity. Some sows give as much milk as other sows and these sows need more feed than the sows which produce less. Sows producing heavily need 10 to 12 pounds of feed per day in order to retain their flesh and produce the milk for their pigs. Where sows are hand-fed and gilts are running with older sows there is great danger the heavy milking sows will not get as much feed as they should. I think the self-feeding of suckling sows is the right way to handle this problem.

After pigs are about 10 days old divide up the litters as to age and size and put the feeds in a self-feeder and let the sows eat all the feed they care for. Experimental work by the U. S. Department of Agriculture shows that where sows are self-fed as against others hand-fed, the sows self-fed held their flesh better, the pigs were heavier at weaning time and it required less grain for 100-pounds gain on both sows and pigs.

I am of the opinion, although I do not have any concrete evidence to the effect, that self-feeding the sows may be helpful in preventing scours in little pigs which often occurs when nursing. I am not saying there are not some hogmen who can hand feed sows that will do as well as if on self-feeders, but for the rank and file of hog producers self-feeding the brood sows while nursing is a practice which should be adopted more universally.

The weight of the litters is further influenced by the amount of feed the little pigs can be encouraged to eat while nursing the sow. This is very important if the litter finds itself trying to get milk from a poor milking mother. Furthermore, sows will begin to decrease in milk flow when pigs are about

Reprinted by permission from Hog Breeder, Chicago, Illinois, Oct., 1947

5 weeks old, just about the time they are making their heaviest drafts on the milk of the sows.

In my experience in weighing pigs, I've seen men who have their little pigs eating feed at a week to 10 days of age, and then there are others who make no effort to feed more than what the little pigs might pick up from the ground when the sows are fed.

If you have self feed brood sows there is no good reason why the little pigs should not eat the same ration as the sows. If the sows are hand-fed a creep should be provided where the little pigs can go and help themselves.

I like the creep idea and hulled oats or rolled oats are probably the best single feeds with which to start little pigs, and little pigs will start to eat rolled oats or hulled oats at a week of age if given the chance. Cracked or shelled corn should soon come into the picture along with a protein supplement consisting of half and half meat scraps and soybean oilmeal and 20% alfalfa meal.

There isn't anything much better than rolled oats and cracked corn self-fed, plus a pint of skimmilk and a chance for the pig to nibble at some green alfalfa or clover hay.

Many pigs suffer a severe setback at weaning time and become runty because they wake up some morning and find the regular lunch counter gone and in its place a self-feeder full of dry ground oats. There won't be a setback at weaning time if these pigs are eating well.

The second matter of which I wish to speak has to do with the running together of too many sows and their litters of uneven sizes and age. The best way I know to produce a drove of uneven hogs is to run 12 to 15 litters or more together with some of 4 or 5 and other litters of 8 to 10. Frequently these large litters are younger litters perhaps by as much as 2 or 3 weeks. Mass production of pigs when they are small is not very succesful. The nearer we can come to caring for each litter as a unit when nursing the sow and still have the method practical the more uniform and better the results will be.

I have in mind two of our very best hog producers who each keep and market about 200 head of hogs annually. Their success is due primarily to the fact that each litter of pigs has a chance to nurse its own mother and is in its own pen with its mother every night instead of being herded all together in one large pen.

There is always a second mistake made with these litters when running together and that is the pigs are usually weaned at the same time. Litters perhaps only 5 weeks of age, pigs weighing 15

pounds, are weaned at the same time as 8 and 10 weeks pigs weighing up to 35 pounds.

The third matter has to do with castration, a task which is too often left for a rainy day. Well it has been too dry with us some of these springs and the pigs have become pretty well grown before the right rainy day arrived, and the pigs suffer quite a setback.

This job can be well done and better done when pigs are about a week old—in fact, we have some producers who are getting the job done when the pigs are as young as 3 days.

The fourth matter of which I want to speak, relates to handling of little pigs so they do not become wormy or infected with such trouble as "necro." I think the most critical time in the life of the pig is the period from birth until the pig is about 50 pounds in weight. If a man can bring his pigs up to 8 weeks of age, thrifty and free from worms, and have these pigs weighing around 35 or 40 pounds his big task as far as that bunch of pigs is concerned, is pretty well done.

Just how this can be accomplished depends a great deal upon the set-up and the plan of hog raising. If you farrow late pigs, they may be farrowed out in a clean field where they have a chance to avoid old infested yards.

The man with earlier pigs who uses a central farrowing house has a slightly more difficult problem. I think a good feeding floor either of wood or cement alongside of the hog house is a wonderful asset for these earlier pigs. If dirt is fed to these pigs and the right sort of ration, there is no reason why these pigs shouldn't remain on such a feeding floor until they are 40 to 50 pounds in weight and then shifted out to a pasture field. The sows could go out to this floor and eat out of self-feeders and then back to their own pens with their litters at night.

Reviewing briefly, then I would say—weigh your pigs at 56 days; then in the fall select out the best gilts and breed them to as good a boar as you have gilts, feed well before farrowing and self-feed the suckling sows afterwards.

Get your pigs to eating feeds such as rolled oats and cracked corn early and do not ever let the barrows know that they were once boars. Treat the litters as units as far as possible and do not crowd the pigs too much while small. And last but not least give your pigs a chance to keep healthy.

Is Farming a One-Man Job?

Condensed from Farm Journal

Jim Wallace

Manager of the Iowa State College Foundation Farms

CAN one man do the best job of farming—even when he has plenty of labor-saving machinery?

I say he can't. Farming is just naturally a two-man proposition.

And I know that this idea probably is the exact opposite of that held by many farmers. They are trying to get away from having a hired man by buying more machinery.

They don't like to be bothered with a hired hand constantly "under foot" in the family circle. Good hired men have been so hard to find that many farmers may have invested heavily in machinery in self-defense. Besides, they think this machinery will make them more money.

I don't quarrel with either one of these objectives, naturally. But I wonder if getting rid of the second man on the farm *really will save money?* M. L. Mosher, of the University of Illinois, who has studied farm management all his life, says this:

"Several years ago our studies showed that net farm earnings per $100 investment increased as the months of labor increased up to 25 or 30 months; after that they decreased gradually as the size of the business increased."

In plain English that means that *a two-man farm is more profitable than a one-man farm.* (It takes two men to supply 24 months of labor a year). I can think of any number of farm jobs—and so can you—where two men can work to much better advantage than one.

A summary of records kept by southeastern Minnesota farmers from 1940 to 1945 bears this out; it did *not* pay them to save labor by using more power machinery.

The additional equipment helped them handle more crops and livestock per man, but they failed to do as good a job, the Minnesota report showed. In fact, their total production went down because they did a less thorough job — poorer-quality work. Crop yields sagged, and their returns per dollar's worth of feed to livestock were lower.

Just last summer a successful New York dairy farmer told me: "I'm better off to hire a married man, pay him well, and give him a good house. I figure I can

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make more profit if I put my money into more and better cows instead of into more machines. Besides, with this second man, I have time for a vacation—short trips with my family. I'm not a slave to my machinery."

And it's a fact that a one-man farm—even with machinery—makes a slave out of a man. How can he get away to go fishing, or even to the hospital if he breaks a leg—unless his neighbors or his wife pitch in? He's tied down by chores 24 hours a day, 365 days a year. It's a steady grind.

Now here's another angle. A southern Iowa farmer, Earl Adams, of Keokuk County, told me recently that he had more money tied up in machinery than in land. He paid $5000 for his rough hilly farm of 200 acres in 1939; *his implements cost him $5900!*

"I'll get it all paid for, thanks to these good times," Adams says, "but I'm sure worried about these young fellows just starting out. The GI going into debt may find himself in a jam later."

That's how I got started on this idea; I wondered if other farmers were going in the same direction.

So I checked the summary of 300 record-keeping farmers in east central Iowa. From 1932 to 1946 the size of these farms scarcely changed, they had the same livestock and the same acreages in crops. But they had replaced three months of man labor with $1200 worth of machinery. Not all of the $1200 can be charged against one year, of course, but even so, the annual charge would be considerable. I checked records in Illinois and Minnesota, and found the same trend.

A North Dakota farmer brought up another good question. He said: "I'm worried; got too much money tied up. Right now I have $20 an acre in equipment on this farm." He had 1200 acres.

The question is, just how far, as a matter of good business, can a farmer go in investing in equipment? When prices drop, we may find ourselves saddled with heavy overhead costs.

Power and machinery costs per crop acre on northern Illinois farms in 1945 averaged $9.65 per acre—half again higher than when the war started. You can cut some costs, but not this one. Your money is tied up.

A farm machinery maker offered this solution to me: "Build up your efficiency by buying all the equipment you can use to advantage. Then boost the size of your farm unit until it's large enough to keep two men, with this machinery, busy the year around."

That sounds fine, but there are difficulties to increasing the size

of the farm. As long as we have expanding industries to absorb surplus farm population, the trend will be toward larger farms. But the first business depression will probably reverse the movement.

Besides, not every farmer can step out and buy or even rent additional land joining his own farm.

Some of our social reformers may have a lot to say about larger farm units, too. There's a constant legislative threat in the background to penalize anything larger than a so-called "family-size" farm, possibly by a graduated tax.

So the safest course, and the happiest, may be to keep equipment costs at a figure that the farm can carry handily, no matter where prices go; also to use a hired man so that you can take time off occasionally to take care of farrowing sows, or even to go fishing.

Reshaping New England Farm Land

Condensed from Better Crops with Plant Food

A. B. Beaumont

Soil Conservation Service, Amherst, Massachusetts

UP New England way, Mother Earth is undergoing face-lifting operations which are not only improving her appearance but are making her more physically fit to meet the strong agricultural competition that is now upon us. Glacial boulders are being pushed around by the thousands, land hummocks leveled, and wet soils drained. While some woods and brush are being cleared from potentially good agricultural land, thousands of trees are being planted on non-agricultural sites. Farm ponds, also, are being constructed in a region naturally well supplied with lakes and ponds. Much of this activity in land improvement is being aided and fostered by soil conservation districts.

The trouble all along has been due to what happened to this landscape during periods of glaciation, some 25,000 to 50,000 years ago—only yesterday in geological time. That glaciation improved the soils of New England, it is generally agreed by pedologists, but every tiller of the soil of this section knows that the land surface was left in far

Reprinted by permission from Better Crops with Plant Food, Washington, D. C., August-September, 1947

from perfect condition. Farmers from the stone-free prairies of the Midwest are often surprised and dismayed by the numerous boulders of New England farm land.

Ten generations of New England farmers have removed many of the field stones. Most of these stones went into stone walls, partly because that was one way to get rid of them and partly because enclosures were needed. Most stone walls of this section antedate the invention of barbed wire by 100 to 200 years. The more numerous the stones, the more frequent were the walls, and the smaller the fields. Many fields or "lots" are two to five acres in area. Such small fields were all right for the period of the ox team and the hand scythe, but are an anachronism in this time of tractors, mowing machines, and pick-up hay balers.

In the old days, it was common practice for the farmer, his sons, and the hired man to "pitch in" after the harvests to "make" an acre or two of land and build a few rods of stone wall—a never-ending back-breaking task. Nathaniel Shaler, famous geologist, estimated that by the last turn of the century as much labor had been expended in the building of stone walls in Massachusetts as had been devoted to building all the roads and all the buildings in the State. We have estimated from a measured sample that there are some 7,500 miles of interior stone walls in Massachusetts, at least two-thirds of which should be removed in the interest of modern farming methods, including the use of power field equipment and the establishment of soil conservation practices.

It is indeed a "far cry" from the simple equipment and low power used by New England farmers of several generations past to the high-powered, complicated, but effective machinery used today for land improvement. Farmers of bygone generations would stand in astonishment at the sight of modern mechanical behemoths now used. Then they had only crowbars, levers, hand shovels, perhaps a home-made capstan, and man-, horse-, or ox-power. Now they have bulldozers of different types, power shovels, draglines, improved stone-boats, and dynamite. I stood in amazement a while ago as I watched a skilled operator with a powerful bulldozer push a 10-ton boulder out of the soil and onto a large steel stone-boat and then hitch to the stone-boat and drag the boulder away.

It is surprising, though, to see what large boulders were moved and placed in stone walls by farmers of earlier periods. But many stones left by former generations of farmers because they had no means for moving them, are now being moved easily with

modern mechanical giants. Some of the larger boulders, and also rock outcrop, are being broken with dynamite before removal. An old practice with respect to huge boulders was to dig holes close by the side of them and then pry them into the excavations. This was a dangerous practice, sometimes causing injury or death. A similar procedure is sometimes employed now, using a bulldozer or power shovel for digging the hole, and there is practically no danger connected with it.

Unfavorable topography is another New England handicap to modern stream-lined farming methods. While glaciation generally softened and smoothed a rough and jagged preglacial topography, there still remain hills and valleys, knolls and slopes, to which square and rectangular fields are no better fitted than is a square peg to a round hole. Small fields make a bad situation worse. Enlargements of fields by removing the stone walls are making it possible to fit the fields to the land rather than attempting the impossible of fitting the land to the fields. It has taken New England farmers a long time to realize the importance of the former and the futility of the latter. Contour-planted rows and strips, sweeping in graceful curves across slopes and around hills, are now appearing on New England farm land, adding charm and beauty to a naturally attractive landscape.

In order that New England farmers may successfully compete with farmers on land more favored by nature, it is increasingly necessary that New England farm land be reshaped for the use of modern farm machinery. This is not a new idea—farmers of this section have done it more or less since the days when they first began removing boulders. But in recent years the amount and the tempo of such work have been markedly stepped up. In a small way the work of glacial forces of thousands of years ago is being undone, and, oddly, the energy stored in the earth in an earlier geological age, in petroleum, is being largely used for the purpose. Powerful machinery actuated by the internal combustion engine is doing the job instead of the hand labor of generations past.

There is no standard procedure or method in the modern disposal of stones. Each farm is an individual case. Disposal is easy and inexpensive when there is a ravine or swamp nearby, into which the stones may be pushed or hauled on truck or stone-boat. Sometimes, as in the case of a stone wall, a deep trench may be dug with power shovel or bulldozer and the stones buried and

covered with at least two feet of soil. Some stones are used to build foundations for farm roads or highways. Sometimes they are simply pushed to the side of a field with no particular consideration for future developments. Such disposal is often unsightly and may later cause trouble. There should be a well-conceived plan for each case of stone removal. Technicians of the Soil Conservation Service assisting district supervisors are rapidly accumulating a body of knowledge of the best methods and procedures in this type of land improvement.

Farmers are spending up to $150 per acre for stone removal. It is hard to justify some current stone removal on economic grounds, but that was also true in the past. However, in the past practically all the work was done by farm help at odd times, and there was little or no cash outlay. Even with a large cash outlay many farmers justify investing more in the improvement of their own land than comparable improved land at a distance from their farms could be bought for, on the basis that they already have a certain overhead in buildings and equipment and that the nearby land helps make a more efficient operating unit.

According to records taken by C. R. Creek, of the Massachusetts Experiment Station, it cost $45 to $135 per acre to remove boulders from a rough pasture with a bulldozer, as a first step in land improvement. An additional $10 per acre were spent in picking up smaller stones in preparation for seeding. Scattered stones were pushed off hay, corn, and vegetable land at costs ranging from $20 to $85 per acre. All this work was done with privately contracted equipment. In Vermont, where equipment is operated by soil conservation districts, costs of similar work have been reported somewhat lower than those above.

Mr. Creek has reported costs of stone wall removal at 85 cents to $1.10 per linear yard, where a trench was dug with a gas shovel and stones were pushed into it with a bulldozer. Somewhat lower costs have been reported in Rhode Island when the stones of a wall were pushed onto a giant steel stone-boat and hauled to a nearby swampy area for disposal. The steel stone-boat in this case was designed by technicians of the Soil Conservation Service and can carry a load of 10 to 15 tons of stone. It can be used for transporting large field boulders as well as the smaller stones of walls. Stone walls are also removed by loading them into trucks with a power shovel and then hauling them away. This method is particularly applicable in cases where

the stones must be removed distances greater than one-quarter of a mile. Shattering of large boulders with dynamite or by heat facilitates their removal by trucks.

Woodland and pastures are being cleared of trees and brush with bulldozers. Uncut large trees are more easily removed than are their stumps, because of the leverage effect gained by the trunk and top. Removal of roots after the trees are cut is a costly job and often as expensive as removal of the trees. Woodland is being cleared at costs varying from $50 to $150 per acre, and pastures with brush and small trees at $20 to $50 per acre. The bulldozer has been found especially adapted to the removal of filler apple trees, which have been removed at 21 to 32 cents per tree.

Land drainage is a high priority problem in New England. Much long-needed work in this field is now being undertaken in this area. There are the small simple jobs on individual farms and the more complicated large community projects involving a number of farms. Soil conservation districts are facilitating drainage work in a big way. Technicians of the Soil Conservation Service are doing the necessary preliminary engineering, and district supervisors are providing either district-owned excavating equipment or the service of private contractors for doing the job. Many of the smaller ditches are being blasted with dynamite. Drainage ditches are being blasted in Massachusetts at a cost to the farmer of 10 cents per linear foot. An advantage of blasting is that no spoil bank is left. For the larger main ditches required in a group drainage project, a dragline or power shovel is the most practical means of excavating. Costs of dragline excavations for drainage in Vermont have been reported from 7 cents to 15 cents per cubic yard.

The construction of farm ponds is still another way in which New England farm land is being reshaped. Although nature endowed this section with thousands of lakes and ponds, there is need for many thousand more small ponds. They are needed for stock water, fire fighting, fish supply, and recreation. A pond for each farm is the goal of one leading insurer of farm buildings. Ponds are constructed with bulldozers and draglines for the most part, but some jobs may be done by blasting. Cost of ponds may vary from $35 to $1,000 or more, depending on size, soil and terrain.

What About Limed Litter?

Condensed from Poultry Tribune

Gordon E. Bearse

Western Washington Experiment Station, Puyallup, Washington

EVERY so often a new idea seems to sweep through the poultry world. Many of these ideas mushroom rapidly and subside nearly as fast, while others withstand the test of time and become established poultry practices.

Riding the crest of a wave of popularity at present is a new litter management practice. This practice, which consists of applying lime to poultry house litter in order to maintain it in better condition, was practically unheard of before the war. However, economic conditions were such during the war years that this idea was favorably received. It is now conservatively estimated that 50 per cent of all commercial poultrymen in Washington are using lime in the litter of their poultry houses.

From news items and letters of inquiry we have received, it would appear that limed litter is being adopted in many other sections of the country where poultry is being raised. The question might be well asked, "Is this just another fad that is here today and gone tomorrow, or will it prove its merits and become an established poultry practice?"

When the practice of liming litter first came into general use, it was assumed from the changed appearance and condition of the straw, peat moss, shavings or other litter material, that the lime dried out the litter. So the product used was a pulverized quick lime which goes through a chemical change involving a combination with water and the release of heat. Sometimes, the use of this kind of lime resulted in fires and more than one poultry house burned down.

Hydrated Lime Preferred

The search for a safer material, many of which have been tried experimentally and in the field, led to hydrated lime. In very closely controlled experiments at Western Washington Experiment Station, it was shown that hydrated lime would do practically the same job as quick lime on either straw or peat moss litter. Furthermore, the cost of the use of hydrated lime was similar to that of quick lime.

Why would hydrated lime accomplish this litter improving

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process when its properties differ so from quick lime? In our research work, we measured the moisture content at regular periods before and after the application of the lime products to the litter. Much to our surprise, the dampness of the litter had not decreased much after liming, in fact, very little more than might be expected when any dry material is added to a wetter one. Furthermore, the decrease in the moisture content of the litter was not much greater for the quick lime treated litter than it was for the litter treated with hydrated lime. It became apparent that other properties of the limes were active in giving the litter its much improved physical appearance.

It appears probable that the benefits derived from the use of lime in litter stem from the litter particle coating properties of the material. The coating of lime reduces the stickiness of the particles thereby removing the tendency of them to cling together. This clinging together of the particles produces the matted or caked condition of the litter which occurs after chickens have been on the same litter for any length of time during certain parts of the year.

Briefly then, litter liming accomplishes the maintenance of poultry house litter in a loose uncaked condition. That is what every poultryman wants.

Is liming litter economical? In the experiments previously referred to, the costs of several methods of litter management were studied. Taken into consideration were the costs of litter, lime and labor involved in the additions, removals and stirrings of the litter. The use of lime with either peat moss or straw litter proved to be more economical than frequent litter removal or variously managed deep built-up litters.

However sound from a litter management cost basis this new method of litter management might be, it would still be unprofitable if the health of the birds were affected. The experience of poultrymen and of veterinarians who have observed the live birds and examined the dead birds in the experiments conducted is that liming is not detrimental to the health of the birds. It has little if any effect on coccidia. Coccidiosis free or immune birds can be maintained continuously on the same litter. As would be expected if health was not impaired, egg production of birds on limed litter was equal in our experiments to that of birds on other litter management practices.

How then is it best to apply lime to litter? Lime can be used in either a shallow or deep litter program. In the shallow litter program, a single application of

hydrated lime is made at the rate of 1 pound to 5 square feet of litter area in order to extend the interval between cleanings from one to two weeks during the wet litter season.

Deep litter can be satisfactorily maintained throughout the year and with less litter by application of lime. Deep litter in which lime is to be used should be about 4 inches in depth. The proper time for lime applications is determined by the tendency of the litter to pack down. This can perhaps best be observed by stirring the litter with a fork and noting whether the litter clumps break up readily or tend to stick together. Another indication of the need for liming is the inability of the birds to move the litter when scratching.

Frequently, liming can be delayed by feeding scratch grains in the litter, by stirring the litter, and by moving the hoppers.

When liming becomes necessary, an application at the rate of 1 pound of hydrated lime for each 2.5 square feet of litter area should be made. The treatment consists of spreading the lime on top of the litter and stirring it in with a fork or rake. Repeat applications can be made as the need arises.

Raising Dairy Calves the Modern Way

Condensed from The Dakota Farmer

Albert M. Wolf

Farm Consultant

TWENTY years ago most dairymen thought it was absolutely necessary to raise calves on milk until they were four to six months of age. Experiments at various experiment stations, however, showed that a dry calf feed, fed to calves as early as two to three weeks of age to replace part of the milk actually aided nature by getting the calf to eat roughage sooner, and thus develop the use of its four stomachs instead of the fourth stomach only, as is the case when kept on a milk diet. It was also found that when older calves were fed milk from pails twice a day, they became so hungry between meals that they gulped down the milk rapidly and, as a result, some of it entered the rumen through the oesophagal slit where it remained and, in souring, caused digestive upsets.

Reprinted by permission from The Dakota Farmer, Aberdeen, S. D., Oct. 4, 1947

When pail feeding calves, it has been found that the use of a teat pail (a large rubber nipple attached to an outlet at the bottom of the pail) raised to the height of the bottom of a cow's udder will get the milk into the fourth stomach without passing any through the slit and hence aid in preventing scours.

When gradually taught to eat a dry calf feed, along with limited amounts of milk, the calves nibbled on the calf feed and hay between milk feedings and hence did not get so hungry between milk feedings. The result was that they were freer from stomach upsets, easier to wean from milk, and grew as well as when fed milk alone.

Every year, dairymen raise five to 5½ million calves in the United States to replace the cows that go out of the milking herds for a great variety of reasons. In addition, a lot of bull calves are raised for breeding purposes. It would require a tremendous amount of milk to raise all these calves and, with the increasing demand for fluid milk and milk products for human consumption, it is not good economy to feed it to calves. With milk at present high price levels, the smart dairyman who sells fluid milk, has turned to the dry-feeding method of raising calves instead of feeding milk (or milk and skim milk) until the calves are six months of age. Milk is fed only for the first three to four weeks. Then the calves are gradually switched to a dry calf feed.

By this method of feeding, only 300 to 400 pounds of whole milk are required during the first three or four weeks—thus saving 1,500 to 1,600 pounds of milk by the use of 150 to 200 pounds of a dry calf feed to feed a dairy calf to six months of age. This saving, at present milk prices can be as high as $50 to $60 per calf.

Nutritional Requirements of Calves

The demands for energy and body-building materials — proteins, vitamins, and minerals— are at their highest level in the suckling calf, since this is the period of most rapid growth. To get the right start in life, the calf must receive as much of its mother's colostrum milk as possible for the first four or five days. This milk contains a higher concentration of food values than the later milk. The colostrum milk contains a higher percentage of solids; a greater concentration of blood proteins; in most cases a higher percentage of vitamins A (sometimes 70 times as much as normal milk) and G; and last but not least, a greater concentration of antibodies (bodies that protect the animal against bacteria and toxins).

This unusual concentration of easily digested energy, body-building materials, and protective antibodies starts the calf's digestive system "in high" at the period when it changes from an organism nourished by its mother's blood stream to one fed by its own digestive system. After the first few days the calf's demand for a highly concentrated food such as colostrum milk decreases, and its needs are, for the most part, furnished by the less concentrated, normal milk of the mother.

The undeveloped eating habits of calves make it necessary that any feed used to replace mother's milk, or to supplement it, must be palatable, easily digestible, and must contain the quality proteins, vitamins, and minerals necessary for balanced nutrition.

The level of protein in a calf food should be at least 20% and preferably 23 to 25% for the first month or two. The USDA Yearbook for 1939 says: "The amount of protein required for normal growth by young dairy stock of the same age and size may vary widely, depending on the nature of the ration and the quantity fed. A minimum quantity of protein will be required if the ration provides an ample supply both of energy and of protein that contains all the essential amino acids. On the other hand, considerably more protein may be required if that supplied is low in one or more of the essential amino acids. If the amount of energy supplied for growth is inadequate, more protein will be used up as a source of energy and will not be available for body building and repair. If the ration contains a considerable excess of protein, it will not be efficiently utilized but this may be compensated for by a more than normal rate of growth, provided the ration also contains plenty of energy. Where high-protein concentrates are used to balance the ration, they increase the variety of amino acids and tend to insure a protein mixture of higher quality for the growing animal."

A prepared calf feed, that contains dried skim milk, dried milk albumin, meat and bone scraps, fish meal, dehydrated alfalfa meal, linseed oil meal, soybean oil meal, wheat middlings, corn meal, and pulverized whole oats, will supply the widest possible variety of proteins and thus assure the calves getting all the essential amino acids for normal growth when taken off a milk diet.

Various experiment station tests have indicated that vitamins A, D, and the B-complex group are needed by calves in greater amounts during the first few weeks of their lives, than later on. This is because the calf is deficient in vitamin A, and the other

vitamins are not synthesized until the rumen begins to function normally—which is several weeks after birth. Calves fed on a milk diet act as one-stomached animals longer than calves fed on dry calf feeds that stimulate the appetite for grain and roughage.

As to the requirements of vitamin A in calves the section entitled "Vitamin A for Dairy Cattle," by Moore, Converse, and Hall, in the 1943-1947 Yearbook of Agriculture, says: "Too little vitamin A in rations of dairy cattle leads to difficulties that sometimes a farmer cannot readily tell from ailments produced by other causes. Young calves that do not get enough vitamin A the first three or four months usually die of scours and pneumonia. If they survive early calfhood and their vitamin A intake is exceptionally low, they are apt to show poor condition, grow slowly, become blind, and have diarrhea and convulsions. Even though enough vitamin A is fed to produce good growth and apparently healthy calves, there still may be a partial deficiency This can be detected only by directly examining the inside of the eye or by determining the vitamin A content of the blood plasma which will be low.

"Except for the first few months of life, depending on the length of the whole-milk feeding period, dairy cattle receive most of their vitamin A in the form of carotene, a yellow pigment in plant material. Carotene is the same pigment that gives the yellow color to carrots and the natural color to butter. In hay and other roughage the yellow color is masked by the green pigments in the plant. The yellow pigment, carotene, sometimes called provitamin A, is changed by the animal body to the true vitamin A, which is almost colorless. The vitamin A in cod-liver oil is the same material as that formed from carotene in the animal body. Young calves receive a considerable supply of the colorless form of Vitamin A in the cow's first milk (the colostrum), whole milk or when their ration is supplemented with cod-liver oil."

Minerals are a most vital factor in the proper nutrition of young calves for they must be available for building bone, teeth, body tissues, blood, etc. Mitchell and McClure, in "Mineral Nutrition of Farm Animals," have stated that calcium, phosphorus sodium, potassium, chlorine, magnesium, iron, sulfur, iodine, manganese, copper, zinc, and possibly cobalt have been demonstrated as performing essential functions in the animal body and are therefore essential in the feed.

Minerals are just as essential in a feeding ration as proteins. They are not medicines as many over-zealous salesmen would

have us believe, but just plain feeding elements that must be present to form a balanced ration. Man in his struggle for a living has, in many areas, so over-cropped the land and failed to refertilize the soil that the crops have robbed the soil of its minerals, since everything was taken out and little put back in the form of fertilizer. That is why it is necessary to provide minerals in feeding rations in order that they may be properly balanced for normal nutrition.

Roughages and grains are low in sodium and chlorine, the elements forming salt. Therefore, a balanced calf feed should contain salt. Calcium and phosphorus are the two minerals required in largest amounts and strangely enough, they are found lacking on good grains and forages in many areas. A good calf feed provides these elements in the form of calcium carbonate, and blood and bone meals. Iodine is lacking in grains and forages in many areas as are the other trace minerals—manganese, iron, and copper. These minerals should be provided as the iodine prevents goiter, and the iron and copper are necessary in the formation of blood. For the proper assimilation of calcium and phosphorus, adequate levels of vitamin D must be provided in the feed.

Feeding Calves By the "Dry Method"

During the first three or four days after birth, the calf should be allowed to nurse its mother at will, or it can be separated from her and taught to drink from a feeding pail, or better still from a "teat pail." When pail fed, calves should be fed not more than ¾ pound of its mother's milk for each 10 pounds of body weight, daily, which means that a 6-pound calf should receive 4½ pounds of milk divided into two or three feedings. All milk should be fed at body temperature. Feeding pails should be thoroughly cleaned immediately after use with boiling hot water. The calf should be warmly housed, well bedded.

Fifth to Fourteenth Day

Continue feeding whole milk, preferably from the mother of the calf, twice or three times daily. Gradually increase the amount fed until the calf is getting one pound of milk for each 10 pounds of live weight. Thus, an 80-pound calf should receive eight pounds of milk divided into two or three feedings.

After each milk feeding, beginning after the first week, plunge a hand into the bag of dry calf meal. Then withdraw hand and let calf suck the fingers. Follow this by placing a little of the dry calf meal in the calf's mouth. Then place a clean feed box

within permanent reach of the calf. Each day, place in it just the amount of calf meal the calf will clean up. After first week place clean, fresh hay where the calf will reach it, also, a block of salt and a constant supply of pure fresh drinking water.

Third and Fourth Weeks

By the beginning of the third week the calf should be eating a considerable amount of dry calf meal. The amount of milk fed can be cut down by one pint or one pound for each two ounces of dry calf meal the calf is eating. By the end of the fourth week all milk feeding can ordinarily be discontinued. By this time the calf should be eating one pound of dry calf meal which will supply the amount of feed needed by the calf in addition to the hay it will be eating. However, if the calf is not well developed or not eating enough of the dry calf feed, partial milk feeding should be continued for a week or two.

Beginning with the fifth week, feed one pound of dry calf meal in two feedings per day. Add a mixture of equal parts of shelled corn and whole oats in the feed box. Gradually increase the amount of corn and oats being fed until a pound of each is being fed daily. The balance of the feed the calf requires will be furnished by the hay it eats. See that the calf has plenty of good, water before it at all times.

leafy, green legume hay and

Third to Sixth Month

Increase the whole oats and corn fed to the amount the calf will clean up in 30 minutes at each of two feedings, but feed only ½ pound of dry calf meal at each feeding. Calves should continue to have plenty of good legume hay. After they are four months old, two or three pounds of good corn silage can be given them.

Feed Hay Early

Place good, leafy, green alfalfa in a hay rack in the calf pen when calves are a week old. Since hay is one of few feeds from which calves can obtain vitamin A, it is absolutely essential that the hay be sun cured, leafy, and with its natural, deep-green color. It is in such hay that the maximum amount of vitamin A is found.

Calves will not eat much hay the first week or two, but it should be kept before them at all times so that they develop a liking for it. Remember, calves need plenty of hay to develop the rumen and build deep-bodied heifers.

Clean Fresh Water Needed

Clean, fresh water should be available to calves at all times. If the barn has a drinking cup system, a drinking cup should be placed in the calf pen. If the calves must be fed water from a pail it should be warmed a bit in winter. Water should be avail-

able to the calves while they are eating their grain ration, for without milk in the diet they need more water. Iodized salt blocks should be placed in the calf pen so that the calves can lick it whenever they desire.

Advantages of the "Dry Method"

The advantages of the dry method of raising dairy calves over the use of whole milk, or whole milk and skim milk feeding, are as follows: (1) saves 1,500 to 1,600 pounds of milk in raising a calf to six months of age; (2) saves time and labor; (3) is more sanitary than bucket feeding; (4) is easily digested and assimilated; (5) provides all the nutritional elements found in milk and some that are not in milk, and (6) encourages calves to eat hay at an earlier age and thus develops their appetite for roughages and helps to build deep bodied, rugged calves.

Calf Pen

After the calf has been removed from its mother on the third or fourth day, it should be placed in a small pen by itself. If this is not possible it can be placed in a pen with other calves of about the same age. Baby calves should not be placed in pens with calves two and three months old. A calf should have about 25 square feet of pen space for it has been found that, when less space than this is provided, calves do not thrive. The pen should be provided with calf stanchions so calves can be locked in when feeding and to prevent them sucking each other. Do not use lead and oil paints on calf pens, especially when partitions are of wood, since calves like to lick paint and, if it loosens up a little and flakes off, it will cause lead poisoning and a terrible death.

Bedding

Calf pens should be kept well bedded at all times and wet bedding should be replaced by dry straw. In winter the bedding should be deeper than in summer. This can be accomplished by cleaning out manure and wet spots daily and then adding another layer of straw.

Feeding troughs and stanchion fronts should be scrubbed with hot lye water once a week to prevent the spread of disease, or stomach upsets caused by fermented milk or food found in or on them. Pens should be cleaned out and scrubbed with hot lye water once a month and then sprayed with dip and disinfecting solutions. If an outbreak of scours occurs they should be cleaned oftener. Under no circumstances allow stale feed to remain in feeding troughs.

Calves can stand and need plenty of fresh air at all times, but it is essential that the ventilation be so arranged as to prevent drafts.

Peace from Grass

Condensed from Capper's Farmer

C. F. Schnabel, B.S., D.Sc.

Most wars are fought for land. Food scarcity or the prospect of it has led peoples into conflict. Nations try to insure their safety and future by taking or defending land. Hunger or fear of hunger destroys reason. Men and nations will commit crimes and trade off their liberty to get something to eat.

But hunger need not be. A way has been found to banish starvation from the earth. It can be done with a fraction of the land in cultivation. No new frontiers are needed. Every nation now can produce the food it needs at home or can trade for what it lacks.

A million farmers with a special food-producing project, a side line if you want to call it that, could banish famine for two billion people. Ten thousand farmers could supply the United States with the scarce, essential food elements. And they could do it with only seven acres apiece. The rest of the farmers could produce the things they always have.

The new way to feed people is to grow and process 40 per cent protein grass. And by grass, I mean crops of the grass family. The 40 per cent protein can be had from wheat, oats, rye, barley, Sudan grass, corn and sometimes from the ordinary meadow grasses. But they must be grown on better land than most farmers have. And they must be harvested at the right time.

Soil can be built up to produce 40 per cent protein grass. It takes about the fertility needed for 150-bushel corn or oats. The more vigorous a crop is, the more protein it will contain at the right stage. I found one sample in Missouri, that contained 45 per cent protein. It might have been grown on many well-manured feed lots in the Corn Belt states.

To do this job of banishing famine and hunger from the world requires two things. First, farmers must grow enough 40 per cent protein grass. Second, plants must be built for taking the important food elements out of the grass. The grass can be grown, and a way to separate the food elements for preservation has been worked out. Patents on the process are pending.

The new method separates the grass leaf into four parts:

Reprinted by permission from Capper's Farmer, Topeka, Kansas, Oct., 1947

1—The fiber which is returned to the farmer for feed. It carries enough of the vitamins needed for cattle.

2—A water soluble portion which contains all the water soluble vitamins and minerals.

3—A fat soluble portion containing all the fat soluble vitamins.

4—A protein portion which is 60 per cent protein.

The last three parts, for human food, will come in three packages for preservation and storage until used. They are well suited for mixing with many types of common foods.

There are probably fifty essential factors in any well-balanced human diet, but no one knows the perfect combination. Fortunately all the essential factors, both known and unknown, are closely linked in natural foods with only four key factors. These key factors are calories, protein, carotene and vitamin C. They make up more than 95 per cent of the cost of any well-balanced diet. Green leaves are the richest combined source of carotene and vitamin C as well as the other green leaf factors. Some greens are essential in the human diet. But the big problem is how to get the desirable factors without getting what we don't want.

You have heard a lot about minimum food requirements. But optimum nutrition is our goal. To get that the average person needs daily 15 milligrams of carotene, 150 milligrams of vitamin C; 3,000 calories; 100 grams of protein. The cereal grains, even at 1947 prices will furnish calories at 1 cent a thousand and protein at 45 cents a pound, or one-tenth cent a gram. There are some green vegetables at least in season that will furnish carotene for $1 a gram and vitamin C for 10 cents a gram.

By using these prices for the four key factors as yardstick values, we can compare the money value and the nutritional value of any food. If you could buy every food you eat for the yardstick values of these four factors, you should get an optimum diet for 16 cents a day. But the average American now spends about 80 cents a day for a diet which supplies less than half enough carotene and vitamin C because most foods cost from 2 to 20 times their yardstick value.

Now we are ready to discuss the money value of 40 per cent protein grass as a human food. A pound contains 1,000 calories, 180 grams protein, 360 milligrams of carotene and 3,600 milligrams of vitamin C, which give it a yardstick value of 91 cents a pound, with at least 20 other vitamins and 15 minerals thrown in for nothing. More than 3 per cent of the dry weight is vitamins. On the same basis steak is worth 11.75

cents a pound, eggs 10.2 cents a dozen, milk 4.02 cents a quart, whole wheat flour 5.78 cents a pound, oatmeal 8.22 cents a pound, butter 4.99 cents a pound, and sugar 1.8 cents a pound.

An acre of land that will grow 40 per cent protein grass at all will produce 4,000 pounds of dry matter within 60 days from date of planting, making a yardstick value of $3,640 an acre. This is ten times the yardstick value of any other crop that can be grown, per day of land use. In competition with other common foods at their present prices 40 per cent protein grass would be worth at least $3 a pound for its vitamins and protein. It contains about as much folic acid as vitamin G. The present retail price of folic acid is now $14 a gram. Thus 40 per cent protein grass is worth at least 25 cents a pound for its folic acid, which is thrown in for nothing at the yardstick value of 91 cents a pound.

Seven million acres of 40 per cent protein grass would provide every one of the two billion people on earth with an optimum vitamin supply and would have a yardstick value of over 25 billion dollars. In contrast, the 100 million tons of human food now produced on 280 million acres of land in America, have a total yardstick value of only seven billion dollars, and supply only half enough carotene and vitamin C for 140 million Americans. Good grass is the one thing we "pay thru the nose for" only when we don't have it.

Unfortunately, the green leaf factors are the most transient and perishable products of nature. After 40 per cent protein grass is produced it must be cut on a certain day and preserved within an hour after it is cut. At present dehydration is the only commercial means of preservation, but dehydration destroys up to 90 per cent of some green leaf factors. Millions of dollars have been spent in the last ten years trying to preserve all the green leaf factors, but only in the last year has any practical progress been made. The preservation problem is complicated because methods which preserve some vitamins destroy others. Besides destroying many vitamins, dehydration is too slow. Dehydration plants are designed to get over the acreage every 30 days, but sometimes as much as 25 per cent of the acreage must be cut in one day. A new type of harvester must be designed which will cut grass in the rain if necessary.

The new method of preservation, now in the laboratory stage of development, separates the fiber of the leaf in the first step and permits the water soluble and the fat soluble vitamins to be preserved separately. The fiber

will be returned to the farmer, carrying just enough vitamins and protein for a perfect cattle feed, because plenty of barnyard manure is a prime essential in the production of 40 per cent protein grass. The other fractions will be sold as concentrates to supplement many other common foods. In that way we can all get an OPTIMUM diet without materially changing our eating habits.

It may cost $100 an acre to maintain land in condition to grow 40 per cent protein grass, but seven million acres is only 2 per cent of the total farm land, or a little over an acre per American farm. A farmer can do a lot of things to one acre he can't possibly do to all of his land. The processing plants will be expensive. A unit to process the grass from 3,000 acres will cost around $100,000. Obviously there must be 3,000 acres of potential 40 per cent protein grass land within a radius of five miles of a proposed plant site. Processors will be ready to handle 40 per cent protein grass in volume before the farmers can produce it in volume. The actual cost of producing and processing will be under $300 a dry ton, so, with a yardstick value of $1,820 a ton, there should be plenty of profit for all who help make it possible, and still make vitamins almost as cheap as water.

Two world wars have cost the American taxpayer over 400 billion dollars and a third world war will destroy civilization. That third world war will certainly come unless famine and hidden hunger are banished from the earth within the next ten years. There are many problems yet to solve, but the fundamentals are certainly sound. No greater challenge was ever presented to American Science, Agriculture and Industry.

Reducing Feed Costs

Condensed from The Shorthorn World

William P. Tyrrell

The University of Tennessee Extension Service

PROTEIN is not only one of the more important, but is often one of the most expensive feeds used on the farm.

Proper use of protein in the feeding of livestock is, however, one of the best means of reducing the amount of corn or other grains necessary to produce a pound of gain. For this reason protein additions can greatly reduce the over-all cost of the ration.

In order that maximum, efficient gains may be obtained, it is necessary that only enough of the best protein supplement be purchased to balance home-grown feeds and also furnish the greatest amount of digestible or available protein at a reasonable price.

Good pasture and high-quality, leafy, legume hay are the cheapest and most important sources of protein. Year-around pasture in the form of legumes and young, tender grasses and good legume hay will do much not only in easing commercial protein shortages when they occur, but also to aid in producing fast, economical gains at a minimum cash outlay.

Commercial proteins are divided into proteins of plant and animal origin. Quality of protein is as important as quantity, therefore rations including different combinations of either animal or plant protein or both, usually produce more desirable feeding results than those including protein only from a single plant source or a small number of plant sources. If purchase is necessary, it is important to buy a protein supplement that will furnish the greatest amount of available protein at the most reasonable price. The cost per unit or the cost of one pound of protein present in the concentrate should be determined before selecting supplements necessary to balance home grown feeds.

Farm sources of protein are: Legume pasture, small grain pasture, legume hay, skim-milk, buttermilk, soybeans and wheat. Commercial sources include animal and plant proteins. Among the commercial sources of animal proteins are: Tankage, meat and bone scraps, fish meal, dried skim-milk, and dried buttermilk. Sources of plant protein include:

Reprinted by permission from The Shorthorn World, Aurora, Illinois, Sept., 1947

Cottonseed meal, soybean oilmeal, linseed oilmeal, peanut oilmeal, corn gluten meal, corn gluten feed, wheat middlings and wheat bran.

Good pasture is the cheapest and most important source of protein, vitamins, and minerals. Young, tender green feed is usually somewhat richer in protein than that of mature grasses which have been either unclipped or checked by mid-summer drought. Immature, actively growing forage plants contain much more protein than the same plants when mature and cut for hay. Young pasture grasses usually contain about 17 per cent protein on a dry basis, while grass hays contain only about 7 per cent. Thus, good succulent pasture is comparable with many protein concentrates, and therefore is worthy of careful consideration as an economical year-around source of protein in livestock feeding.

Not all the protein present in a feeding material is available. That part of the total protein which is actually digested and used by the animal is known as digestible protein.

The number of pounds of digestible protein in 100 pounds of dry matter in green crops approximates: For oat pasture 8 inches high, 30.0; rye pasture 5 inches high, 28.2; wheat pasture 5 inches high, 21.0; alfalfa, immature to 10 inches high, 20.0; Kentucky bluegrass, before heading, 17.7; red clover, before bloom, 17.1; white clover, 15.4; kudzu vine, 13.7; mature annual lespedeza, 13.6; crimson clover, all analysis, 13.2; barley fodder, 10.2; Bermuda grass, mature, 8.2; and red top, mature, 4.8.

Small grains pastures used during the fall, winter and early spring are one of our most important sources of protein if supplied when the grass is young and tender. Alfalfa and the clovers provide an excellent source of this all-important nutrient during various seasons in the year, but are especially needed as supplementary pasture during the dry summer months, when permanent pastures have temporarily lost their value.

Legume hays are a rich source of protein on the farm. Together pasture and legume hay make up about 60 per cent of all protein used by livestock in the United States. Alfalfa hay is one of the best sources of proteins and vitamins. Other high-quality legume hays, such as clover and lespedeza, are good sources of these nutrients and should be included in the feeding program whenever practicable.

The percentage of digestible protein in the dry matter of cowpea hay averages 13.9; of kudzu vine hay, 13.3; soybean hay, all analysis, 12.2; alfalfa hay, all

analysis, 11.7; hay from crimson clover, 10.9; lespedeza hay, all analysis, 10.3; and red clover hay, all analysis, 7.9.

The quality of any hay is largely determined by the number of leaves present as well as the brightness of its color. The leaves of legumes usually contain a much greater supply of protein than the stems, therefore, care is necessary in harvesting to see that excessive shattering does not take place, as this loss is extremely serious from a feeding standpoint. Alfalfa, red clover and annual lespedeza are among the principal roughages used. It will be noted that these feeds are quite comparable in protein although it is generally felt that good quality alfalfa hay is superior to other common farm roughages, in furnishing the necessary protein, minerals and vitamins for animal growth.

Many farm rations have been found to be unbalanced because of lack of either the necessary quality or quantity of protein. The purchase of commercial supplements to correct these deficiencies has come to represent one of the major cash expenditures for feed. The term crude protein, as commonly used on most feed tags to designate the total amount of protein present in a feed is misleading to most farmers, as it does not represent the true value of the protein present. Since crude protein, as listed, is about 75 per cent to 80 per cent digestible, the following method may be used to determine the digestible protein a feed contains.

For example, if the crude protein is 40 per cent, 75 per cent of 40 is 30 per cent, which is the approximate per cent of digestible protein present. Forty-one per cent cottonseed meal, so-called, runs 33.9 per cent digestible protein. Linseed oilmeal running on the average of 35.3 per cent crude protein runs about 30.7 per cent digestible protein. Some other feeds run, the crude protein figure given first and followed by that for digestible protein: Soybean meal, 44.3 to 37.7; peanut oilmeal, 42.7 to 38.0; corn gluten meal, 42.9 to 36.5; corn gluten feed, 26.4 to 22.7; wheat standard middlings, 17.4 to 14.4; wheat bran, all, 15.8 to 13.1; 50 per cent meat scraps, 50.8 to 46.7; fish meal, all, 58.7 to 47.5; skim-milk, 3.7 to 3.5; buttermilk, 3.5 to 3.3.

Many of these protein supplements are interchangeable, depending upon their relative availability and price on the market. Plant proteins with a given digestible protein percentage might well replace other plant proteins of comparative feeding value. This is true also in the case of animal proteins. In some cases plant proteins can replace in part

or in whole, certain animal proteins, provided mineral mixtures are added. The kind and amount of protein supplement needed will vary with the different classes and ages of livestock and the purpose for which they are being fed as well as the kind and amount of grain, hay and pasture available. Since the quality of protein is as imoprtant as the quantity for most livestock, rations including different combinations of the plant and animal proteins, or both, usually produce more desirable feeding results than those made up of a smaller variety of feeds.

Fertilizing the Rotation

The best time in the rotation to add that big shot of plant food is on the small grain in which a legume-grass mixture is seeded.

That's what more farmers and soils men are coming to believe each year.

Minnesota soils man Paul Burson recently averaged the results of a five-year test on 174 farms, in which all fertilizer went on at once. The results look good. The system increased flax yields 1.3 bushels per acre, corn yields 6.5 bushels per acre, and alfalfa nearly a ton an acre.

Burson, who calls the system "fertilizing the crop rotation," used only phosphorus in the test. He applied 20 pounds of phosphorus (100 pounds of 0-20-0) for each year the legume-grass mixture stayed in the rotation, including the year seeded. No additional fertilizer was used until the land was re-seeded. (Enough phosphorus can be stored in most soils for the other crops that follow in the rotation.) All were five-year rotations.

Burson is recommending to Minnesota farmers whose land needs potash, and who use a mixed fertilizer such as 0-20-10 or 0-20-20, that enough fertilizer be put on to furnish the right amount of phosphorus.

That is, if the grass-legume is kept for two years after the seeding year, apply 300 pounds of the mixed plant food. The same would be true if nitrogen, or both nitrogen and potash, were needed.

All soil needs naturally won't respond to this "one-shot" treatment, but many will. It's worth thinking about. Certainly it's easier, if you can, to apply fertilizer only once in every four or five years than every spring.

Farm Journal

Reprinted from Marketing Activities, Washington, D. C., March, 1947

Utilizing Vegetable Wastes

Condensed from Marketing Activities

Louis B. Howard

EVERY year several million tons of vegetable matter rich in protein, carotene, and riboflavin go to waste on farms and in processing plants. This matter includes discarded culls, vines, leaves, tops, roots, trimmings, peelings, and even whole crops that remain in the fields because quality is poor, demand is lacking, or labor is short. For some years USDA researchers, contemplating this good green mass, have been asking how it could be put to use. Lately they've been getting some answers.

Since leaves form the most valuable portion of the vegetable wastes, chemists of the Department's Eastern Regional Research Laboratory, operated by the Bureau of Agricultural and Industrial Chemistry, for several years have been studying the carotene and riboflavin content of leafy wastes, and methods of extracting and purifying it.

Working with the Delaware Experiment Station, these researchers have studied the nutritional value of dried leaf meals and ways of preparing them as a poultry feed supplement. The studies have revealed that some vegetable wastes have so much carotene, they can be used to produce vitamin concentrates. Dried pea vine wastes compare favorably in quality with commercial alfalfa meal, and other dried wastes are better. The nutritional value of the leaf portions of the various vegetable wastes used in the experiments was about twice that of the stems. Broccoli leaves were high in protein, carotene, and riboflavin. Poultry feeding tests showed that broccoli leaf meal is better than lima bean meal for poultry feed, and nutritionally better than commercially produced alfalfa meal. Vegetable meal produced from turnip and carrot tops was as good as alfalfa meal, which in turn was a little better than meals produced from pea vines.

The laboratory researchers have developed a method of separating the leaf blades, rich in protein and vitamins, from the less valuable stems and midribs. Leaves tested were of broccoli, beets, spinach, turnips, carrots, and lima beans. Each required a slightly different treatment.

Pea vines and carrot tops can be successfully dried in alfalfa

driers. They are porous and easier to dry than beet tops, turnip tops, and lima bean and broccoli leaves, which must be turned frequently as they dry. This turning can be managed successfully if the driers are equipped with a series of aprons or conveyors that turn the material and break up the lumps.

It was found that the leaf-blade portion of vegetable wastes (except pea vines) can be flash-dried with air at 240° F. The leaf becomes dry and brittle, the stems remaining moist and tough. Stones break up the leaves and separate them from the wet stems within a rotating screen. Thence the leaf material passes into a grinder, issuing as meal.

The stems are then chopped or crushed, which makes them dry easier. Stems produce a lower-grade product of less nutritional value. The stem product and the leaf meal are marketable either mixed or separate. Pea vines can be dried, ground, and screened without a separation of the leaf parts.

The experiments brought out the importance of getting the raw material into the drier quickly. It is easier to feed carrot tops and similar material into the drier when they are chopped, but chopping is not recommended for large, succulent leaves such as broccoli leaves, which tend to lose carotene and their fresh green color the finer they are cut. Scorching reduces the value of the meal for feed; a drying temperature of about 240° F. seems to give the best results. The moisture content should not exceed 10 percent.

The cost of processing these wastes into leaf meal is estimated to range from less than a cent a pound (lima bean waste) to about 3 cents (beet tops).

The research men advise caution in connection with insecticides. Be sure, they say, that if the meal is made from crops treated with lead arsenate or copper compounds, the poisons are not present in the meal in toxic quantities.

What has been done to dispose of this waste in the past? How much of it is there in the United States? To what extent might we utilize such an amount? What considerations are involved in commercial utilization? Which vegetables offer the best prospects?

On the farm there have been, in general, two ways to dispose of green vegetable waste. Part of it could be used to feed the animals on that farm. And part of it could be plowed under. At the processing plant, disposal has been expensive as a rule. Some plant operators have solved the problem by keeping a herd of cattle to eat the waste, but in

general it has had to be treated for disposal as sewage, or hauled to a dump or back to the farms it came from.

In considering how vegetable wastes might be utilized on a commercial scale, USDA has made studies to determine (1) how much of various kinds of waste is available, (2) which production areas offer the best supply sources, and (3) the seasonal yields of various type of waste in each production area.

Leafy wastes offering the greatest returns (because of their nutritive value and the quantity grown) include beets, broccoli, cabbage, carrots, cauliflower, kale, lima beans, peas, rutabagas, spinach, tomatoes, and turnips. Tomato leaves cannot be used to produce leaf meal, but their suitability for use in manufacturing animal feed more than makes up for this inadequacy.

The time and the length of crop seasons vary, depending on the vegetable and the place. This fact must be taken into account in any plan to utilize vegetable wastes commercially. For example, the season for growing peas in most areas is relatively short, but cabbage is available in the Pacific coast region the year round. The opening and closing dates of the packing season also vary by product and area. For example, tomatoes are packed in Michigan from mid-August through September, in California, from July 10 to November 10. Since the pea processing season is short it would be unprofitable to install driers for the waste from this crop only, unless the vines could be ensiled to prolong the drying season. But it might be possible to combine the drying of pea vines with the production of alfalfa meal.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUG. 24, 1912, AND MARCH 3, 1933

of the Farmers Digest, published 11 issues a year at Ambler, Penna. for October 1, 1947

State of Pennsylvania | ss
County of Montgomery |

Before me, a Notary Public in and for the State and County aforesaid, personally appeared L. Bush-Brown, who, being duly sworn according to law, deposes and says that he is the busines manager of the Farmers Digest and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor, managing editor and business manager are: Publisher, L. Bush-Brown, Ambler, Pa.; editor, L. Bush-Brown, Ambler, Pa.; assistant editor, C. Leavitt Dyer, New Hope, Penna.; business manager, A. E. Heick, Ambler, Pa. 2. That the owners are: L. Bush-Brown, Ambler, Penna.; C. Leavitt Dyer, New Hope, Pa.; A. E. Heick, Ambler, Penna. 3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: none. Signed, L. Bush-Brown, Publisher.

Sworn to and subscribed before me this 3rd day of October, 1947. (Seal). John Cassidy, Notary Public. [My commission expires January 7, 1951.]

Proper Care of Electrical Cords

Condensed from Ohio Farmer

Electrical cords need careful handling. Mistreatment soon causes the insulation and covering to break. This may cause a fire if these broken cords are used under rugs or near any furnishings that will catch fire easily.

Ever since household electric appliances first came on the market much has been said about handling the cords. Yet these electric cords which carry the current to the various pieces of electrical equipment still suffer damage from mistreatment. Repair shops the country over still do a flourishing business in fixing cords that have been worn, broken, frayed or burned in home use.

Because of the danger of fire, it is much more important that these cords be kept in good condition from the beginning rather than wait until they are in need of a trip to the repair shop. They should be kept dry. A wet cord is dangerous since it may cause a short circuit. Also moisture may damage the protective covering over the wire.

A few other easy rules to keep electric cords in good condition are: keep them free from grease which rots the rubber covering; store them away from heat and never wind a cord around a hot appliance or let it get close to hot radiators or stoves; grasp the plug, not the cord, when disconnecting the appliance to prevent pulling the wires loose from the plug.

It is also important to keep cords free from kinks, knots or sharp bends which may break fine wires and damage the covering. Never place them where they will be stepped on or pinched, such as under rugs or heavy furniture. A cord should not be nailed to the wall—use insulated staples to hold cords up off the floor.

Connect cords at convenient outlets, not to light fixtures because these do not carry enough electricity for most appliances. Plug in and disconnect cords at convenient outlets in walls rather than at the appliance to prevent damage to the appliance terminal.

After using an appliance, put the cord away carefully. A cord that is permanently attached to an appliance may be wound around it after it is cool. Detachable cords may be coiled loosely and laid flat in a drawer or on a shelf. Or they may be hung over a wooden peg or rod, large enough to prevent a sharp bend. Take care of electrical cords and they will serve you safely for a long time.

Ohio Farmer

The number of pages in this and in the previous issue has had to be curtailed temporarily because of paper shortage.

AMONG THE NEW BOOKS

THE HORSE OF THE AMERICAS — By Robert Moorman Denhardt, editor of The Western Horseman; foreword by J. Frank Dobie.

This book tells the history of the Western Horse, and the part he has played in the development of the Americas. Here you have a fascinating account of the "Western Mount" from the time that Columbus planted the seed stock in the West Indies, through the period of the Conquest of both North and South America, to the cow horse of the late 19th century and the modern Quarter Horse. Breeds, types, strains and colors are discussed. Material is appended on the evolution of the Western saddle, brands, the rodeo, and the American Quarter running horse.

The Horse of the Americas is a beautifully printed book — contains over 300 pages of text, 20 pages of illustrations.

Publishers: The University of Oklahoma Press. Price $5.00.

MANAGEMENT AND FEEDING OF SHEEP — By E. T. Baker.

This is a practical treatise on the selections, care, and breeding of sheep intended to meet the needs of farmer, flockmaster, and student of agriculture. In chapters covering (1) The Farm Flock, (2) Western Range Sheep, (3) Commercial Lamb Feeding, the three distinct types of sheep raising, as practiced in this country, are fully discussed. The book abounds in helpful suggestions for the successful treatment of the various diseases, ills, and accidents to which sheep are subject.

Publishers: Orange Judd Publishing Co. Price $3.50.

"Cultivators of the earth are the most valuable citizens. They are the most vigorous, the most independent, the most virtuous, and they are tied to their country, and wedded to its interests, by the most lasting bonds."

—Thomas Jefferson